Please cut where indicated and insert the label into the plastic pocket on the spine of the binder.

BIDIRECTIONAL™ TRACTOR SERVICE

9030

Vol. 1

40903000

BIDIRECTIONAL™ TRACTOR SERVICE

9030

Vol. 2

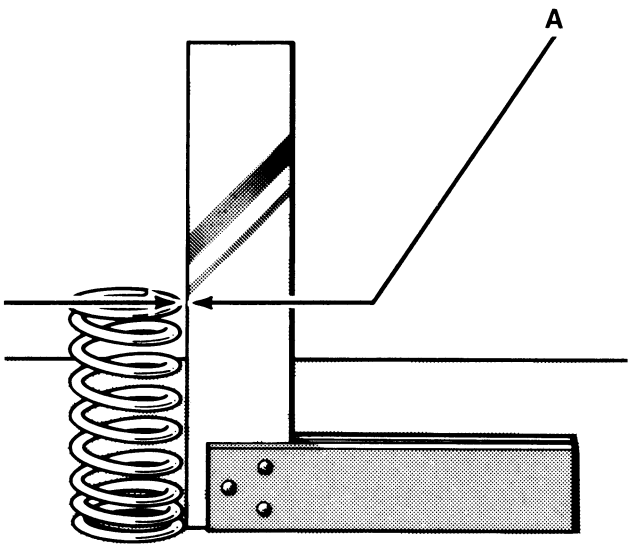
40903000

06900901

	AS REQUIRED	DAILY 10 HOURS	WEEKLY 50 HOURS	100 HOURS	200 HOURS	300 HOURS	400 HOURS	YEARLY 1000 HOURS	1200 HOURS OR 2 YEARS	LUBRICANT[6]	NO. OF POINTS
Lubricate three-point hitch cab end and engine end				X[1]						B	4
Lubricate the PTO drivelines in the pivot area					X[1]			3		A	3
Lubricate window and door hinges		X								A	6
Clean air cleaner filters		X[8]				X[8]					
Check air cleaner tube connections			X								
Change air intake filters		X[9]									
Change engine oil and filter			X[2]		X					A	
Change fuel and water separator filters						X					
Check alternator/fan/water pump belt		X									
Change hydraulic/hydrostatic oil filters					X						
Change coolant and add coolant additive									X		
Check transmission oil					X[3]			X			
Check drop axle oil					X[3]					D	4
Check PTO clutch/splitter box oil					X[10]		X			E	
Check PTO drop box oil					X[10]					C	
Check hydraulic/hydrostatic oil	X[3]										
Adjust parkbrake		X									
Check and/or adjust PTO clutch control		X		X							
Drain contamination from fuel tanks					X						
Check wheel bolt torque					X[4]						
Torque axle mounting bolts					X						
Check and/or change cab air intake filter							X				
Check air-conditioner sight glass for bubbles. Clean condenser		X									
Check PTO transfer case oil					X[10]						

1 Lubricate more frequently under continuous use.
2 Change oil and filter after the first 50 hours of operation and every 200 hours thereafter.
3 Change oil after the first 50 hours of operation and every 1000 hours thereafter.
4 Torque wheel bolts after the first half hour of operation, and every 50 hours until 400 hours, and every 200 hours thereafter.
5 Torque rim or clamp every 10 hours until 50 hours, every 50 hours until 400 hours, and every 400 hours thereafter.
6 See Lubricant Brand Equivalancy Chart.
7 After first 100 hours of use, drain, flush and replace the oil and additive in the Dana Powr-lok® differential.
8 Clean out element as recommended and inspect the inner element. Check indicator light function every 300 hours.
9 Replace the air filter yearly or sooner in dusty conditions.
10 Change oil every 400 hours.

SYMPTOM	PROBABLE CAUSES	REMEDY
Engine overheats	1. Hose connection leaking or collapsed	1. Tighten hose connection. Renew hose if damaged
	2. Radiator cap defective or not sealing	2. Renew radiator cap
	3. Radiator leakage	3. Repair/renew radiator
	4. Improper fan belt adjustment	4. Re-adjust fan belt
	5. Radiator fins restricted	5. Clean with compressed air
	6. Faulty thermostat	6. Renew thermostat
	7. Internal engine leakage	7. Check for source of leakage. Renew gasket or defective parts
	8. Water pump faulty	8. Overhaul water pump
	9. Exhaust gas leakage into cooling system	9. Renew cylinder head gasket. Check head for damage or distortion
	10. Coolant aeration	10. Tighten all connections and check coolant level is correct. Ensure cylinder head gasket has not blown
	11. Cylinder head gasket improperly installed	11. Renew cylinder head gasket
	12. Hot spot due to rust and scale or clogged water jackets	12. Reverse flush entire cooling system
	13. Obstruction to radiator air flow	13. Remove the obstruction
	14. Extended engine idling	14. Do not allow engine to idle for long periods
	15. Oil cooler tube blocked	15. Clean
	16. Radiator core tubes blocked	16. Check free flow



Valve Spring Squareness **Figure 1A-17**
A Maximum out-of-squareness 0.06 in. (1.52 mm)

2. Use Kit No. FNH02136 to ream out the valve guide to accept an oversize valve. The kit contains three reamers and pilot combinations as follows:

   - 0.003 in. (0.076 mm) Oversize Reamer and Standard Diameter Pilot.
   - 0.030 in. (0.76 mm) Oversize Reamer and 0.015 in. (0.38 mm) Oversize Pilot.
   - 0.015 in. (0.38 mm) Oversize Reamer and 0.003 in. (0.076 mm) Oversize Pilot.

   When going from a standard valve stem to an oversize, always use the reamers in sequence. After reaming a valve guide, check the valve seating and reface if necessary.

Valve Springs

1. Renew worn or damaged valve springs. Check for squareness and reject if out-of-squareness exceeds 0.060 in. (1.52 mm), Figure 1A-17. Check the free length and loaded length of each valve spring. See "Specifications" in this section. Be sure the valve spring retainer locks are in good condition.

CYLINDER HEAD — INSTALLATION

1. Attach a suitable lifting device to the cylinder head lifting brackets.

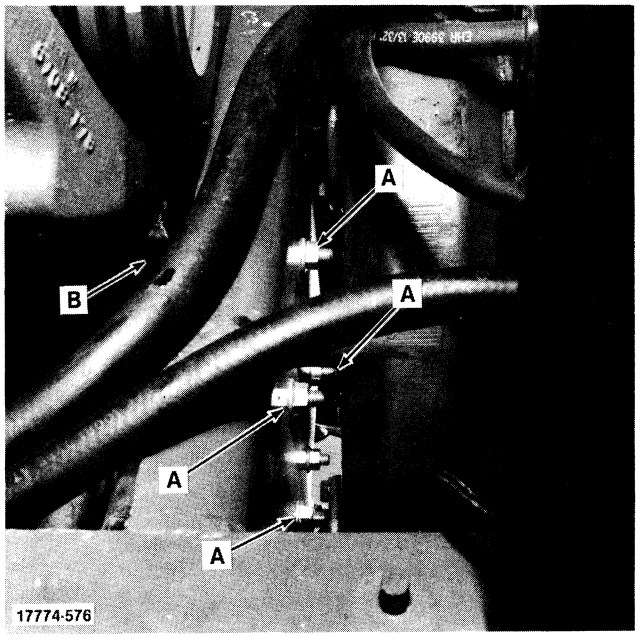
   NOTE: Be sure all traces of gasket material are removed from the head and the block prior to assembly. Failure to do so will cause inadequate sealing between the cylinder head and block. Make sure all cylinder head bolt holes are clean.

2. Place a new head gasket on the cylinder block, then carefully position the cylinder head on the gasket. Two dowels are on top of the cylinder block at opposite corners to aid in positioning the cylinder head and gasket.

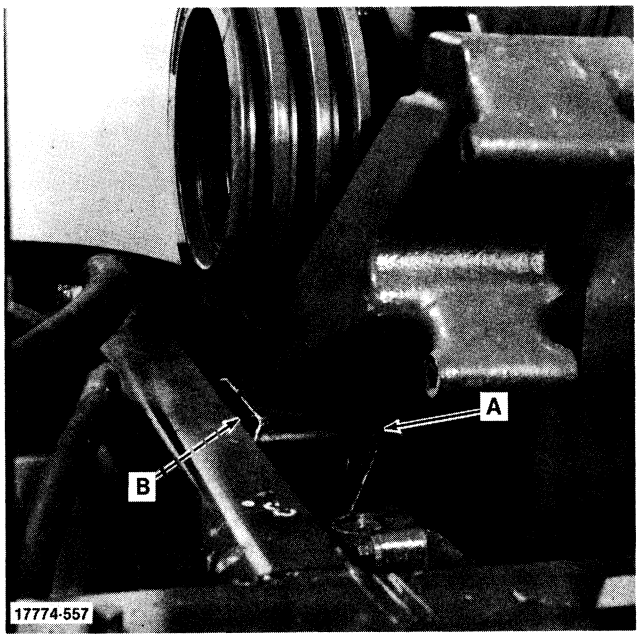
3. Lubricate the cylinder head bolt threads with clean engine oil and install them finger-tight.

4. Install the valve push rods with the cupped ends up, in the holes in the cylinder head from which they were removed. Be sure the ball ends of the push rods are seated in the tappet sockets. Fill the cupped ends of the push rods with the specified engine oil.

5. Position the rocker shaft assembly on the cylinder head. Use the long cylinder head bolts with the rocker arm shaft. Make sure that the ball ends of the rocker arm adjusting screws are seated in the cupped ends of the push rods.



Engine Mount **Figure 1B-9**
A Bolts
B Engine mount



Engine Mount Center Bolt **Figure 1B-10**
A Engine mount
B Center bolt

21. Be sure the engine is level and move it forward. At the same time observe that all cables, electrical leads, tubes, and fuel lines are disconnected. When the engine is clear of the flywheel housing lift it straight up until it clears the frame.

22. Place the engine in a suitable stand.

ENGINE — INSTALLATION

Before installing the engine in the tractor, verify that all required parts have been transferred from the replaced engine. Determine that the front engine mount is in the frame as far to the right as it will go.

1. Lower the engine into the tractor frame with the flywheel end slightly lower than the front end.

2. Carefully align the splitter box splines.

   NOTE: Engage the PTO clutch so the splitter box shaft will not rotate. Rotate the engine flywheel until the splitter box shaft splines engage in the flexplate.

3. Install the flywheel housing bolts, B, Figure 1B-8, and socket head bolts, A. Install bolts, D, Figure 1B-4. Torque the bolts to 125 lbs.-ft. (170 N·m).

4. Install the front engine mount, B, Figure 1B-9, and secure with the four bolts, nuts, and washers, A.

5. Install the front engine mount center bolt, B, Figure 1B-10. The bolt passes through the mount and the rubber mounting pads.

6. Position the starter in place and secure with bolts, C, Figure 1B-4. Install the electrical leads and the positive battery cable, A.

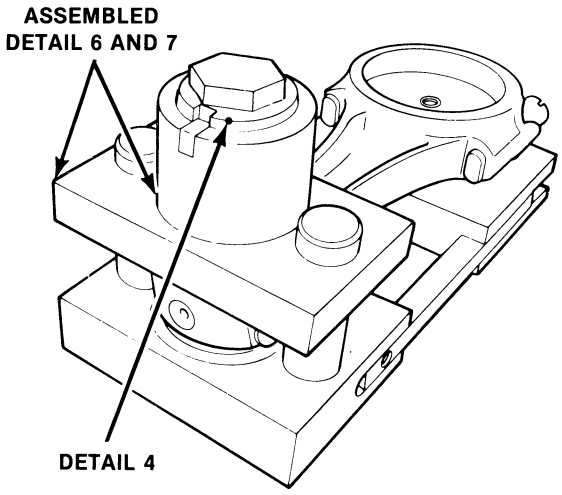
7. Install the battery ground cables, B.

8. Install the upper and lower radiator hoses.

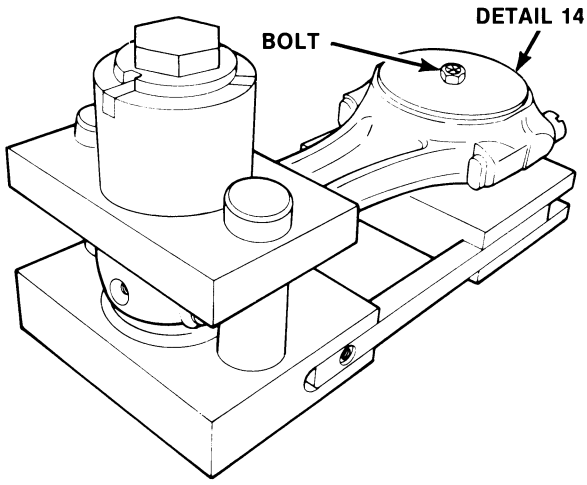
9. Install the heater hoses to the inlet valve and return hose fitting. Open the heater inlet valve.

10. Connect the throttle cable, G, to the throttle lever on the injection pump. Install the fuel line and leak-off lines.

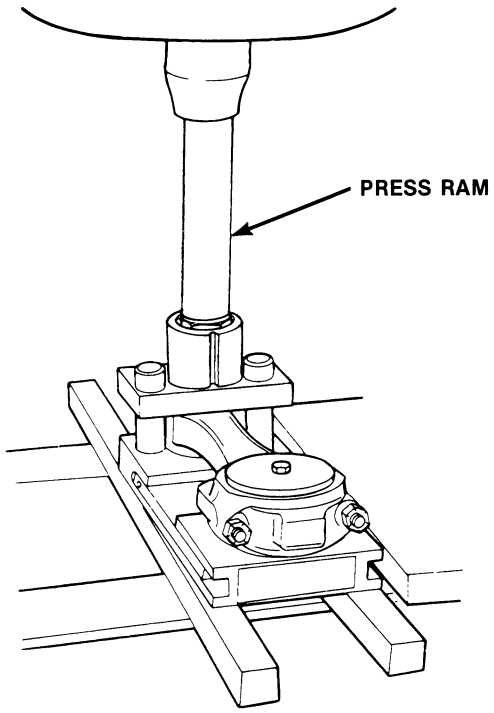
11. Install the engine speed sensor in the flywheel housing. See "Engine Speed Sensor — Installation", Section 3, Electrical, in this manual.



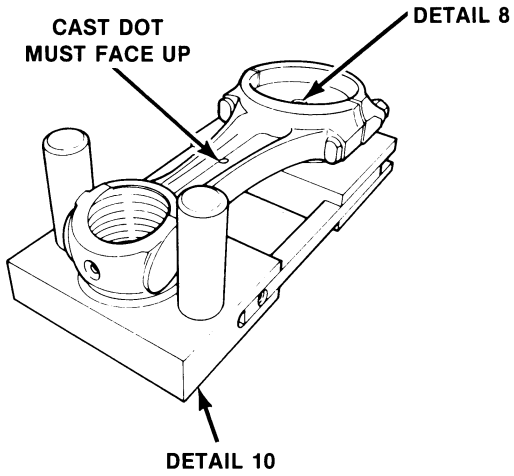
Connecting Rod Bushing - Removal — Figure 1B-33



Connecting Rod Bushing - Removal — Figure 1B-34



Connecting Rod Bushing - Removal — Figure 1B-35



Connecting Rod Bushing - Installation — Figure 1B-36

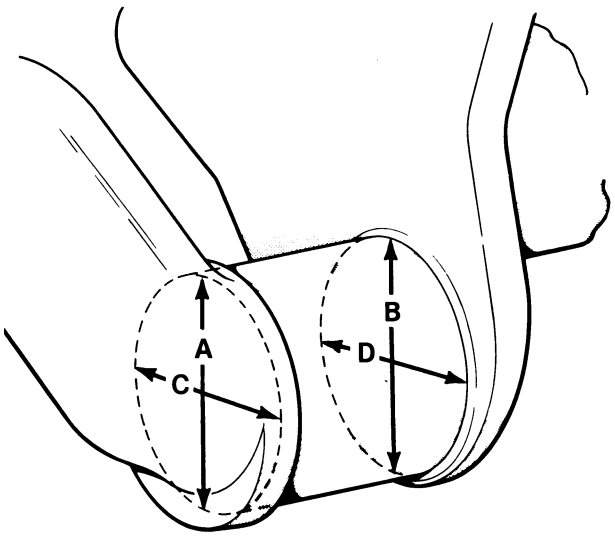
6. Place assembled Detail 6 and 7 over Detail 4 keyway and base dowel pins, Figure 1B-33.

7. Place Detail 14 over crank end and secure with the small bolt provided, Figure 1B-34.

8. Press the bushing out by applying force to the head of the large bolt, Figure 1B-35.

Bushing Installation

NOTE: The small end of the connecting rod has a partial chamfer on the dot side of the rod. It is necessary that the sharp edge remaining in this diameter is removed to ensure Detail 8 enters freely, Figure 1B-36.



Crankshaft Journal Measurements Figure 1B-56

3. Remove the crankshaft pulley and engine front cover. See "Front Cover and Timing Gears" in this section.

   NOTE: If the crankshaft is removed with the cylinder head in position, make sure all timing marks are aligned prior to assembly. This action will prevent possible interference between the valves and pistons during assembly.

4. Remove the oil pan, the oil pump, and intermediate shaft, and the balancer. See "Oil Pump — Removal" in this section.

5. Remove the connecting rod and main bearing caps and liners. Identify the parts to facilitate assembly.

6. Carefully lift the crankshaft out of the cylinder block.

Inspection and Repair

NOTE: Current production engines may have a crankshaft with main or crankpin journals ground 0.010 in. (0.25 mm) undersize. These are identified with the letters '010 MUS' and/or '010 PUS' respectively. The letters are stamped on one of the crankshaft counterbalance throw.

Inspect the balancer drive gear in the center of the crankshaft. If damaged or worn, replace the complete crankshaft or gear as follows:

1. Early 9030 tractors have a crankshaft with a machined center drive gear. The complete crankshaft will have to be replaced if the gear is worn or damaged.

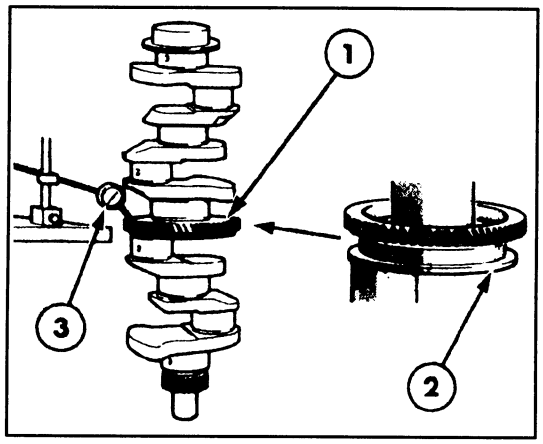
2. Later production 9030 engines have a crankshaft with a heat shrink balancer drive gear. This gear can replaced as follows:

   a. With a suitable tool split the gear, and remove from the crankshaft.

   b. Clean off any residue or burrs, from the gear journal, and stand the crankshaft in a vertical plane with the nose, to the ground.

   c. Heat the new ring gear to 380-420°F (193.3-215.6°C). Carefully place over crankshaft journals to mating journal.

   d. Ensure the gear tooth is aligned to the timing mark on the crankshaft to 0.030 in. (0.76 mm) and push the gear home.



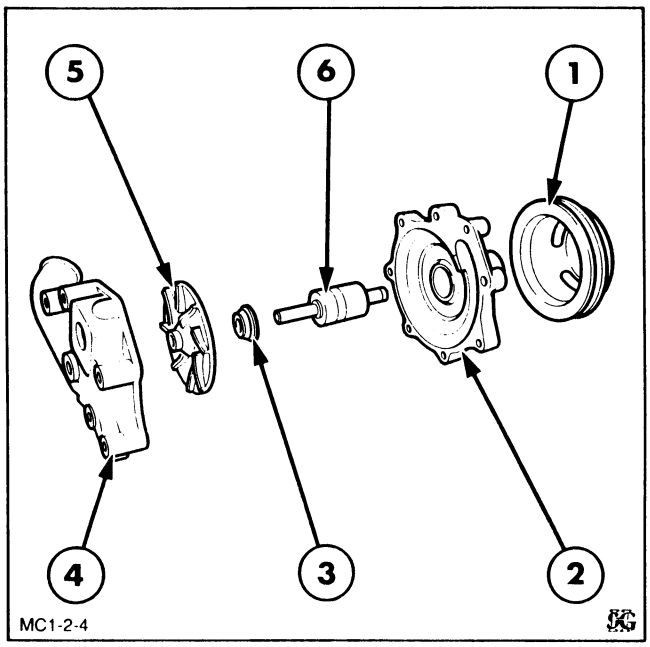
Crankshaft Balancer Gear

1 Balancer gear
2 Gear location
3 Dial indicator

   e. Check gear is fully seated to the shoulder, by supporting in the engine or between centers, and check runout with a dial indicator. Total Indicator Reading (T.I.R.), should not exceed, 0.010 in. (0.25 mm).

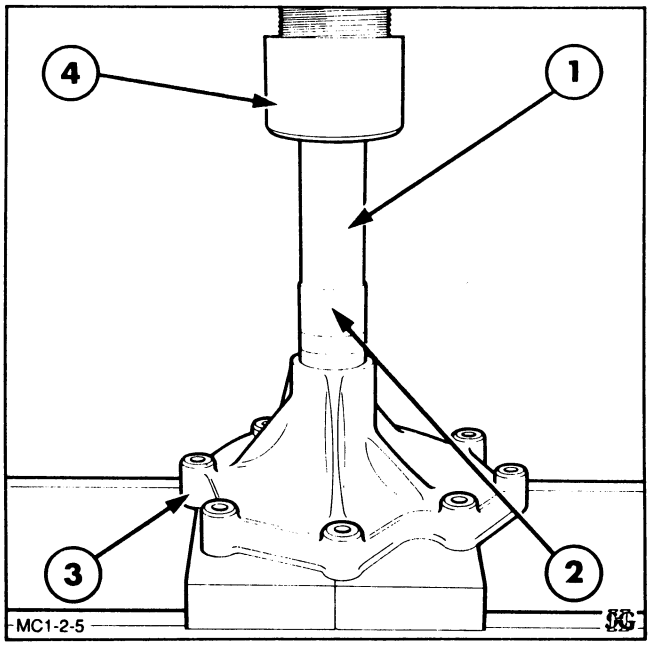
Clean the crankshaft and drilled passages. Dress minor imperfections with an oil stone and grind severely marked journals to the next undersize bearing.

Measure the diameter of each journal in four places to determine out-of-round, taper, or wear as shown in Figure 1B-56. Measurement 'A' compared with 'B' indicates vertical taper while measurement 'C' compared with 'D' indicates horizontal taper. Measuremens 'A' and 'B' compared with 'C' and 'D' indicate journal out-of-round.



Water Pump Components **Figure 1C-7**

1 Pulley
2 Front cover
3 Seal assembly
4 Rear cover
5 Impeller
6 Bearing shaft assembly



Water Pump Shaft and Bearing Assembly Installation **Figure 1C-8**

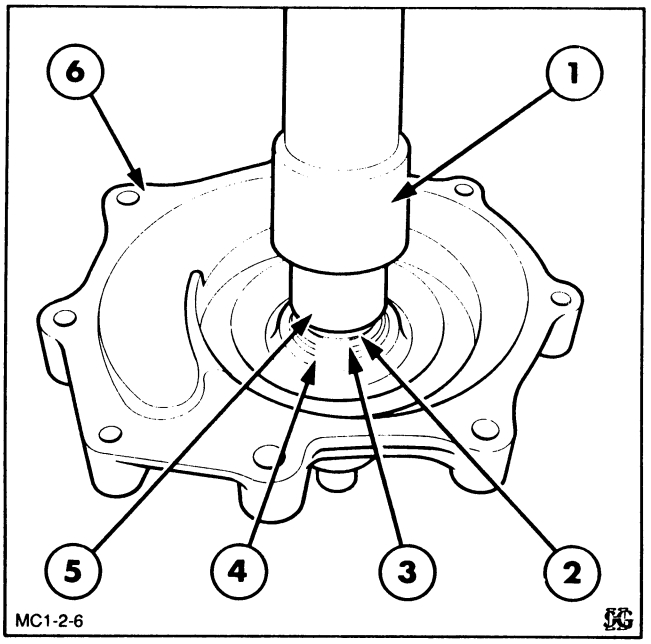
1 Sleeve
2 Shaft and bearing assembly
3 Front cover
4 Press

WATER PUMP – INSPECTION AND REPAIR

1. Check the impeller for worn or damaged vanes and inspect the seal on the rear face of the impeller. Install a new impeller if the seal or vanes are damaged.
2. Inspect the bearing shaft for scoring or any other damage.
3. Check both parts of the pump housing for cracks or signs of leakage. Replace any defective parts.

WATER PUMP – RE-ASSEMBLY

1. Use a sleeve, which passes over the shaft and rests on the outside diameter of the bearing, to press the bearing and shaft assembly into the housing until the bearing is flush with the face of the housing, Figure 1C-8. Use a straight edge to check the final position.
2. Turn the pump housing over and position in a press with the seal bore facing upwards.
3. Coat the outer diameter of the seal flange with a thin application of the thread sealer and position the seal assembly over the shaft in the center bore of the housing.



Water Pump Seal Assembly Installed **Figure 1C-9**

1 Press
2 Seal
3 Spring
4 Seal retainer
5 Tool No. FNH04672
6 Front cover

Crankshaft Balancer

Gear Backlash ..... 0.002-0.010 in. (0.05-0.25 mm)

Shaft-to-Bushing Clearance ..... 0.0002-0.008 in. (0.005-0.020 mm)

Shaft Diameter ..... 0.9895-1.000 in. (25.133-25.400 mm)

Backlash between Balancer and Crankshaft Gear ..... 0.002-0.008 in. (0.05-0.20 mm)

End Float, Balancer Gear-to-Support ..... 0.008-0.020 in. (0.20-0.51 mm)

Flywheel

Runout of Clutch Face (Between Outer Edge of Friction Surface and Mounting Bolt Holes) ..... 0.005 in. (0.127 mm)

Ring Gear Runout ..... 0.025 in. (0.64 mm)

Oil Pump

Rotor Clearance ..... 0.001-0.006 in. (0.025-0.15 mm)

Rotor-to-Pump Housing Clearance ..... 0.006-0.011 in. (0.15-0.28 mm)

Rotor End Play ..... 0.001-0.0035 in. (0.025-0.089 mm)

Relief Valve Pressure ..... 60-70 psi (4.1-4.8 bar) at 2000 rpm

Relief Valve Spring Tension ..... 1.07 in. (27.2 mm) under 10.7-11.9 lb. (4.85-5.40 kg) load

Oil Specifications

Temperature	Oil Viscosity and Type	API Classification	Engine Oil & Filter Change Period (hours)
Below 10°F (-12°C)	Low Ash, SAE 5W Supplement 1 or Low Ash	CC	75
	SAE 5W/20 Supplement 1	CC	75
	or SAE 10W-30	CD	75
10°F to 40°F (-12°C to 4°C)	Low Ash, SAE 10W	CD	150
	Series 3 or SAE 10W-30	CD	150
32°F to 90°F (0°C to 32°C)	Low Ash, SAE 20	CD	150
	Series 3 or SAE 10W-30	CD	150
Above 75°F (24°C)	Low Ash, SAE 30 Series 3	CD	150

NOTE: When using diesel fuel with a sulphur content below 1.0%, Series 3 diesel engine oil with an A.P.I. classification of CC may be used instead of CD oil, but the oil and filter change interval must be reduced to 150 hours.

When using diesel fuel with sulphur content between 1% and 1.3% use only oils listed above, but reduce the oil and filter change period to every 50 hours.

19. Remove the front engine mount center bolt, 1.

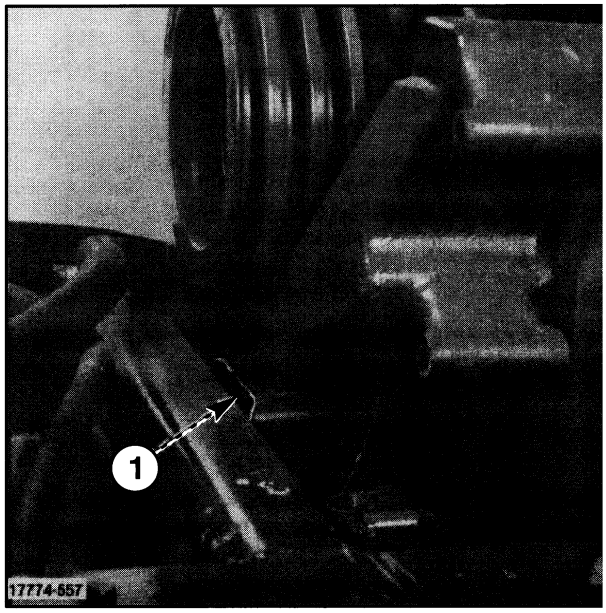


Figure 1E-1

20. Remove four bolts, 1, and move the engine mount, 2, to the right as far as possible.

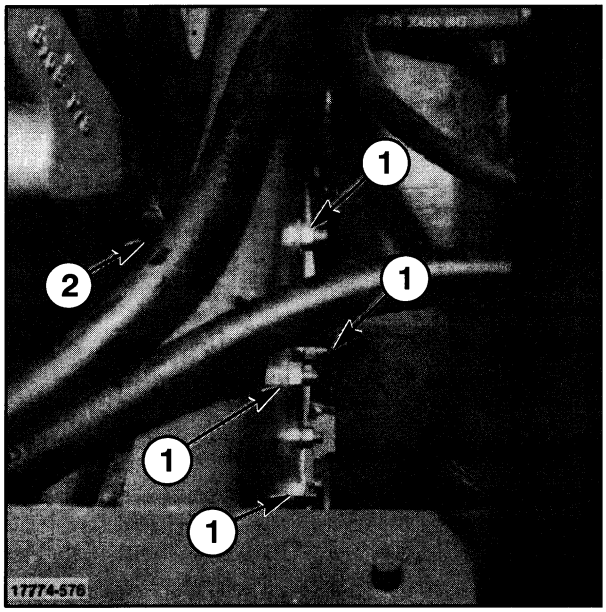


Figure 1E-1

SEAL REPLACEMENT (FLYWHEEL END)

1. Remove the engine from the tractor as noted in "Engine Removal," leaving the flywheel housing and splitter box on the tractor.
2. Remove the dampener, 1, and flywheel, 2.

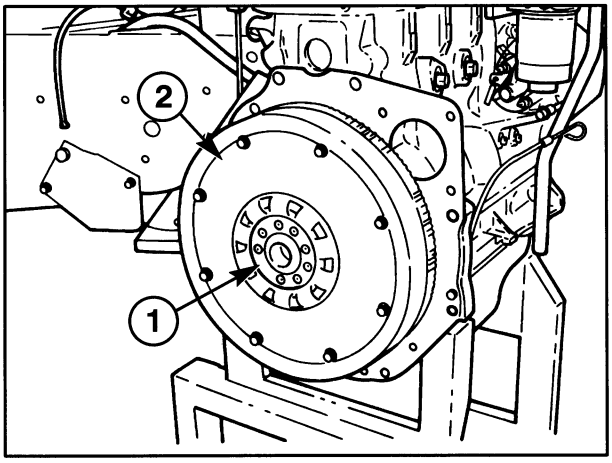


Figure 1E-37

CAUTION: THE FLYWHEEL IS HEAVY. SECURE THE FLYWHEEL WITH A CHAIN, 1, OR SUITABLE LIFTING DEVICE WHENEVER REMOVING OR INSTALLING IT TO AVOID POSSIBLE INJURY.

3. If the starter is on the engine, remove it. Remove the adapter plate, 2.
4. Using a suitable container, drain the oil from the engine by removing the plug from the bottom of the oil pan.
5. When replacing the oil seal retainer gasket, remove the oil pan from the engine. Two of the front oil pan bolts thread into the oil seal retainer.

   NOTE: Removing the oil seal retainer from the engine damages the oil pan gasket. Replace it before reinstalling the oil pan.

6. Rotate the engine until the #4 piston is at top dead center. Install a sturdy wooden post, about 100 mm x 100 mm (4″ x 4″) thick, across the bottom of the engine.

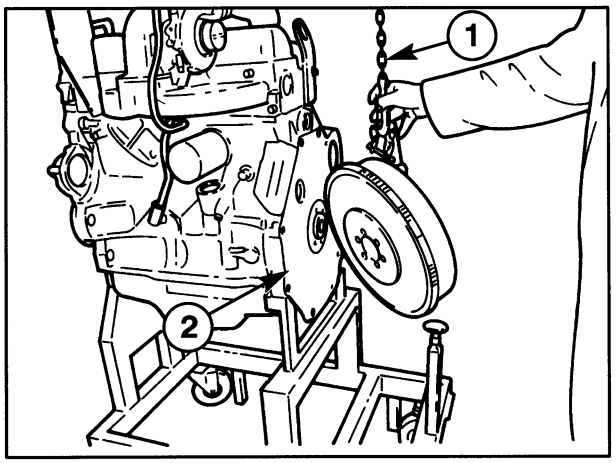


Figure 1E-38

ROCKER SHAFT REASSEMBLY

1. Inspect the rocker shaft for signs of wear or damage on the internal and external diameters. If it is not up to specification, replace it with a new one. If reused, clean thoroughly in solvent before reassembly, making sure all oil passages are clear.
2. Position the shaft identification groove, 6, to the top front. This ensures that the oil grooves and holes face downwards.
3. Assemble the rocker shaft support, 5, with long head bolts, 1, placing the springs, 4, and spacers, 3, in the proper locations.

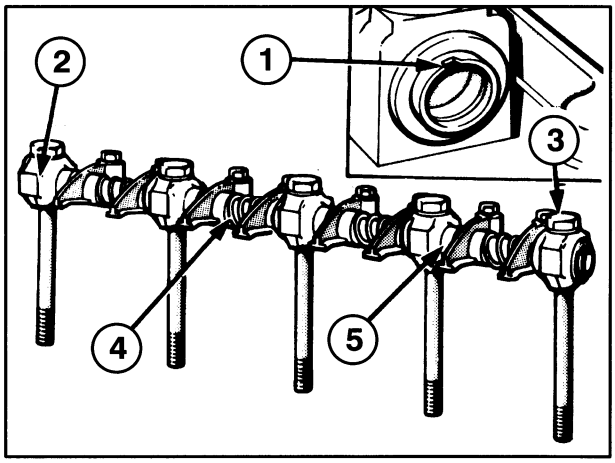


Figure 1E-61

ROCKER SHAFT INSTALLATION

1. Inspect the rocker arm adjusting screws, 1, and pushrod ends of the rocker arm, including the ball end of the screws, for nicks, damage or excessive wear.
2. Inspect the inside diameter of the rocker arm for damage or wear. If it is not within specification, replace it.
3. Check the ends of the pushrods, 2, for damage or wear. If the pushrods are not to specification or are not straight, install new rods.

   NOTE: Replace any bent pushrods with new ones. Do not attempt to straighten them.

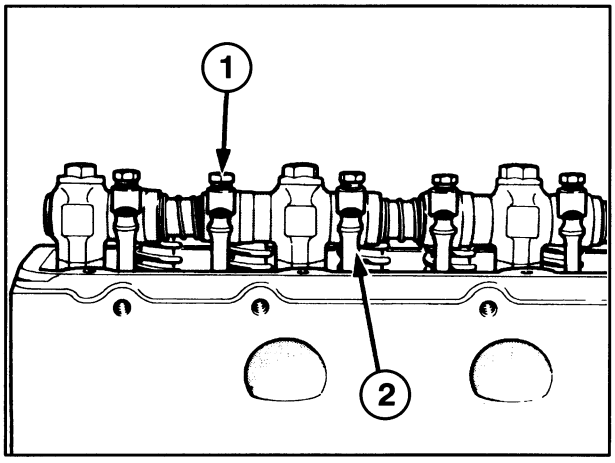


Figure 1E-62

CYLINDER HEAD REASSEMBLY

NOTE: All gaskets, seals, and O rings must be replaced with new upon reassembly. Where new sealant is to be applied, refer to "Engine Specifications."

1. Insert the valves into the guide bores from which they were removed and lap with a suitable paste. Remove all traces of paste after lapping.
2. Lubricate all components with clean engine oil on reassembly. Use a spring compressor to reassemble the valves, valve springs, retainers, rotators and collets and install new umbrella seals.
3. Coat all components with clean engine oil prior to assembly, and insert each pushrod, 1, into its original position, ensuring each ball end is seated in its cam follower.

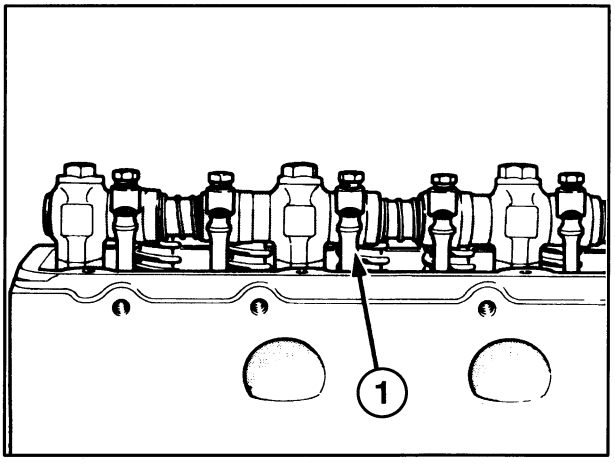


Figure 1E-63

1. Measure the outside diameter, 1, of the sleeve in several places and average the dimensions. Counterbore the cylinder block (see step 2) using the average dimension to obtain a press fit between bore and sleeve. Interference of the sleeve to the cylinder bore should be 0.025 mm - 0.076 mm (0.001″ - 0.003″).
2. Counterbore to a depth of 209 mm (8.26″), from the block face. Surface finish of the bore should not exceed 80 microns. Leave a step at the bottom of the bore, minimum 4.572 mm - 5.080 mm (0.180″ - 0.200″), allowing for runout of chamfers.
3. Bore through diameter to the diameter of 114.3 mm - 116.0 mm (4.454″ - 4.456″).
4. Clean the cylinder bores and thoroughly dry.
5. Grease the sleeve with ESA-MIC75-B or equivalent, and press the sleeve home to the lip in the bore. The top of the sleeve should protrude through the top of the block, 0.127 mm - 1.0 mm (0.005″ - 0.040″).
6. Bore the sleeve to 110.00 mm -111.76 mm (4.3985″ - 4.400″).
7. Skim the block face and top of sleeves to achieve the specified flatness of 0.08 mm (0.003″) in any 152 mm (6″) or 0.03 mm (0.001″) in any 25.4 mm (1″). Maintain a chamfer in the internal diameter at the top of the sleeve to 45° x 0.51 mm (0.020″) to prevent piston damage on reassembly.
8. Break the sharp edge at the bottom of the sleeve prior to honing.
9. Hone the cylinder bore to:

   Grade A:
   111.778 - 111.798 mm (4.4007″ - 4.4015″)

   Grade B:
   111.798 - 111.818 mm (4.4015″ - 4.4023″)

   NOTE: Surface finish should be an average of 20 to 30 microns, crosshatched at 35° - 55°.

   Maximum Taper: 0.001″ (0.025 mm) through to bottom of the bore.

   Maximum Ovality: 0.0015″ (0.038 mm)

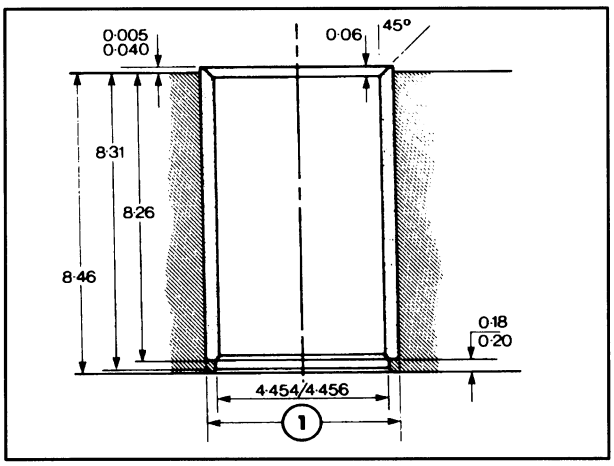


Figure 1E-83

Inches (in.)

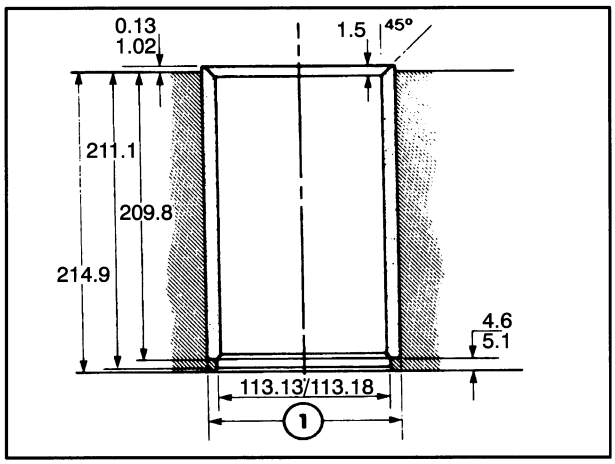


Figure 1E-84

Metric (mm)

2. With the rear of block face clean and free of old sealer, install a new gasket and apply sealer, D or J, to faces, 1.
3. With the plate in the recess, install and tighten the twelve bolts in sequence to 16 - 23 N·m (12 - 17 ft lbs).

   The edges of the retainer and seal assembly should be even with edges of block to within 0.08 mm (0.003″), 3. If not to specification, loosen and realign the retainer in the recess and repeat the installation procedure.

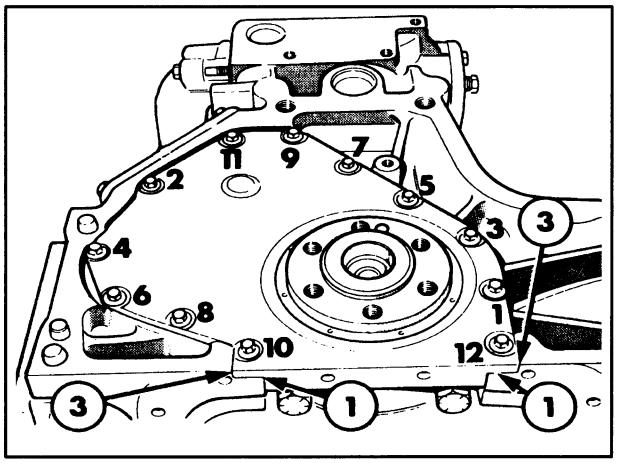


Figure 1E-103

Grease and Sealants

Code	Number	Name
A	NLG1 Grade 2	Grease
B	ESF-M1C43-A	Grease-Silicone Light Consistency
C	ESE-M4G194-B	Sealer-Anaerobic Low Strength
D	ESE-M4G195-A	Sealer-Silicone
E	SP-M4G9112-A	Sealer-Polyester Urethane
F	SP-M4G9112-C	Sealer-Polyester Urethane
G	ESE-M4G217-A	Sealer-Arearobic
J	SP-M2G9121-B	Sealer-RTV Silicone Rubber
K	82995772	Thread and Stud Lock
L	82995771	Flexible Gasket Sealant

4. With the new crankshaft seal installed, 1, place a dial indicator on the end of the crankshaft, 2, and make sure seal runout is within 0.51 mm (0.020″) total indicator reading.

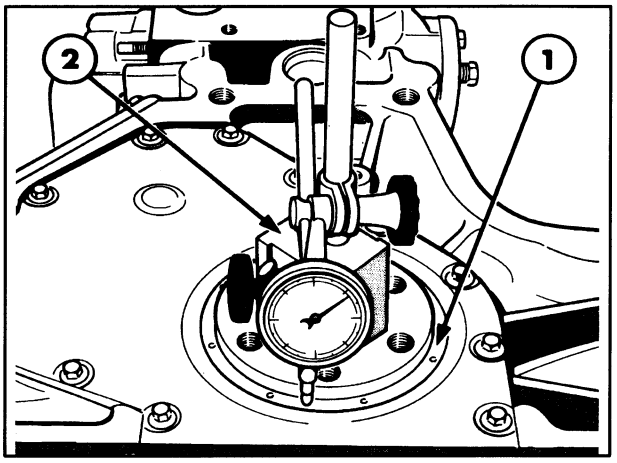


Figure 1E-104

EXHAUST VALVES

Face Angle ..... 44°15′ - 44°30′ Relative to the Head of Valve
Stem Diameter ..... Std: 9.401 - 9.421 mm (0.3701″ - 0.3709″)
0.076 mm (0.003″)
Oversize: 9.477 - 9.497 mm (0.3731″ - 0.3739″)
0.38 mm (0.015″)
Oversize: 9.781 - 9.802 mm (0.3851″ - 0.3859″)
0.76 mm (0.030″)
Oversize: 10.163 - 10.183 mm (0.4001″ - 0.4009″)
Head Diameter ..... 42.88 - 43.13 mm (1.688″ - 1.698″)
Stem to Guide Clearance ..... 0.048 - 0.094 mm (0.0019″ - 0.0037″)
Lash Clearance (Cold) ..... 0.43 - 0.53 mm (0.017″ - 0.021″)

INTAKE VALVES

Face Angle ..... 29°15′ - 29°30′ Relative to Head of Valve
Stem Diameter ..... Std: 9.426 - 9.446 mm (0.3711″ - 0.3719″)
0.076 mm (0.003″)
Oversize: 9.502 - 9.522 mm (0.3741″ - 0.3749″)
0.381 mm (0.015″)
Oversize: 9.807 - 9.827 mm (0.3861″ - 0.3869″)
0.762 mm (0.030″)
Oversize: 10.188 - 10.208 mm (0.4011 - 0.4019″)
Head Diameter ..... 47.37 - 47.63 mm (1.865″ - 1.875″)
Stem to Guide Clearance ..... 0.023 - 0.069 mm (0.0009″ - 0.0027″)
Lash Clearance (Cold) ..... 0.36 - 0.46 mm (0.014″ - 0.018″)

VALVE SPRINGS

Number per Valve 1
Free Length ..... 60.7 mm (2.39″)
Length, loaded at 27.7 - 31.3 kg (61 - 69 lbs) ..... 48.26 mm (1.900″)
Length, loaded at 61 - 69 kg (135 - 153 lbs) ..... 35.69 mm (1.405″)

VALVE TIMING

Intake Opening ..... 12° Before Top Dead Center
Intake Closing ..... 38° After Bottom Dead Center
Exhaust Opening ..... 48° Before Bottom Dead Center
Exhaust Closing ..... 12° After Top Dead Center

COOLING SYSTEM

DESCRIPTION AND OPERATION

The function of the water pump mounted at the front of the engine is to maintain a continuous flow of coolant around the cooling system. This is essential to ensure correct engine temperature and performance during vehicle operation.

The pump is driven by a poly V-belt from the crankshaft pulley when the engine is running. A spring-loaded belt tensioner, bolted to the front face of the water pump, maintains fan belt tension.

The cooling system on the tractor engines is of the recirculating bypass type with full-length water jackets for each cylinder. The coolant flows from the bottom tank of the radiator into the water pump, which passes the coolant to the cylinder block. The coolant then flows through cored passages to cool the cylinder walls.

Passages in the cylinder head gasket allow coolant to flow from the cylinder block into the cylinder head. Cored passages also conduct coolant to the fuel injector nozzle locations before re-entering the water pump below the thermostat.

The thermostat is located in the top of the water pump body and controls the flow of the water, as required by temperature changes.

NOTE: A faulty thermostat may cause the engine to operate at too hot or cold an operating temperature. If not replaced, this could result in a damaged engine or impaired engine performance.

When the thermostat is closed a recirculating by-pass is provided to allow the coolant to recirculate from the head to the block for faster warm-up.

Once the engine has reached its normal operating temperature, the thermostat will open and allow water to be drawn through the radiator by the pump action. Cooled water then returns to the engine system.

Cooling occurs as the coolant passes down through the radiator cores, which are exposed to the air drawn through the radiator by the fan.

NOTE: Do not operate an engine without a thermostat. Use a solution of 50% clean water and 50% FNH heavy duty antifreeze. When not using FNH antifreeze, add a 5% solution of inhibitor FW-15, available from New Holland dealers, to the cooling system.

The cooling system includes a drain plug on the left-hand side of the cylinder block.

COOLING SYSTEM SPECIFICATIONS

SPECIFIC TORQUES

Torque Values	N·m	ft lbs
Balancer Bolts	115	85
Camshaft Gear Bolt	58	43
Camshaft Idler Drive Gear-To-Block	237	175
Camshaft Gear Plate Bolts	38	28
Connecting Rod Bolts	146	108
Connecting Rod Nuts	109	80
Cover Bolts (Blanks Oil Drilling)	31	23
Crankshaft Pulley-To-Crankshaft	224	210
Crankshaft Rear Oil Seal Retainer:		
Initial Tightening	11	8
Final Tightening	20	15
Cylinder Head Bolts (Engine Cold)	217	160
Dynamic Balancer - Cylinder Block	88	65
Exhaust Manifold-to-Cylinder Head	38	28
Exhaust Pipe-to-Flange	31	23
Fan-to-Pulley Bolts	27	21
Flywheel-to-Crankshaft	197	145
Front Adapter Plate-to-Cylinder Block	19	14
Idler Gear-to-Block	237	175
Injector Attachment Bolts	23	17
Injector Line Nuts	24	18
Injection Pump-to-Front Adapter Plate	24	18
Injection Pump-to-Gear Nut	51	38
Intake Manifold-to Cylinder Head	35	26
Leak-Off Tube Banjo Fitting Bolts	11	8
Main Bearing Bolts	197	145
Oil Filter Retaining Bolts	65	48
Oil Filter Mounting Bolt Insert	34	25
Oil Pan Drain Plug	41	30
Oil Pan-to-Cylinder Block	34	25
Oil Pressure Switch Assembly	31	23
Oil Pump-to-Block	49	36
Self-Locking Screw - Valve Rocker Arm	24	18
Single Fan-to-Pulley Nose Thread	27	21
Starter Motor-to-Rear Adapter Plate	31	23
Thermostat Housing Bolts	24	18
Turbocharger-to-Exhaust Manifold Nut	44	33
Valve Rocker Cover Bolts	24	18
Water Pump Cover-to-Pump	27	20
Water Pump-to-Cylinder Block	48	35
Water Pump Bypass Hose Clamps	24	18

DESCRIPTION AND OPERATION

The fuel system used on the 9030 tractor, Figure 2-1, consists of two fuel tanks, fuel pump, fuel filter/sediment separator, fuel injection pump, fuel injectors, and the connecting fuel lines.

NOTE: Beginning with serial number D932000 (1993) an electric fuel pump was installed on production 9030 tractors. For electric fuel pump installation on 9030 tractors prior to 1993 see Service Bulletin 2/90-T10.

The 9030 tractor has two fuel tanks connected by a fuel crossover pipe. Fuel is drawn from the crossover pipe through a hose to a filter assembly, to the lift pump in the injection pump. The lift pump draws the fuel through a water separating filter and fuel filter to the injection pump. The injection pump meters the fuel to the injectors. Excess fuel flow, used in cooling, is returned from the fuel pump to the left side fuel tank or to the right side fuel tank connections. Part of the fuel is recirculated back to the clean fuel line.

SPECIAL TOOLS

	Number
Kit-Injector Cleaning	FNH01720
Injection Nozzle Tester	FNH01721 or FNH03161
Socket - Nozzle Nut Torque	FNH08126
Adaptor Set	FNH01728
DPS Injection Pump Test Kit	FNH00883
3 Bar Gauge Set	FTC213312

TROUBLESHOOTING — BASIC

There are certain items that must be checked and verified before any parts are replaced.

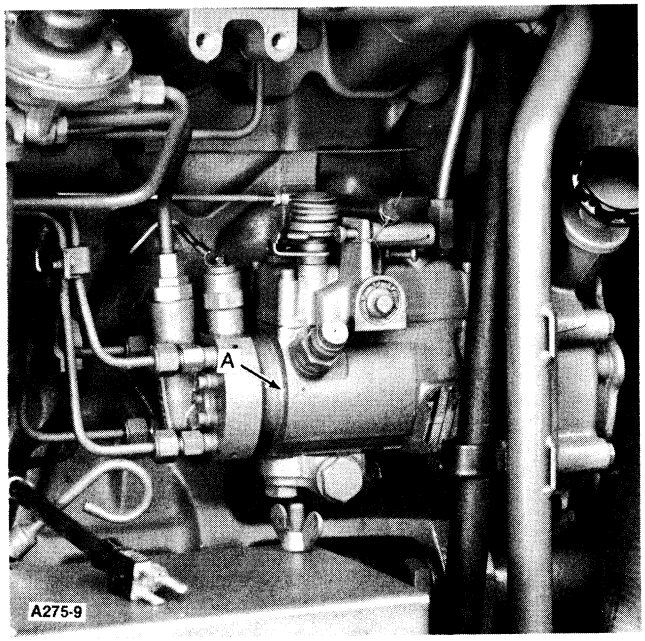
CAUTION: DO NOT SERVICE THE FUEL SYSTEM UNLESS THE ENGINE IS COOL. FUEL SPILLED ONTO A HOT EXHAUST MANIFOLD MAY CAUSE A FIRE.

- Be sure the throttle linkage is properly adjusted.
- Check the fuel shut off solenoid and the electric fuel pump if installed.
- Check the fuel supply and return hoses for restrictions in the articulation joint or under the cab.
- Inspect the fuel filters. Be sure they are clean and primed with clean fuel when they are replaced.
- Check the lines and hoses for leaks. Tighten all loose connections.
- Drain the fuel tanks of accumulated condensation at the drain plug.

IMPORTANT: Whenever effecting a repair the reason for the cause of the problem must be investigated and corrected to avoid repeat failures.

The following tables list problems and their possible causes with recommended remedial action.

SECTION 2A
FUEL INJECTION PUMP & FUEL INJECTORS



Fuel Injection Pump — Figure 2A-1

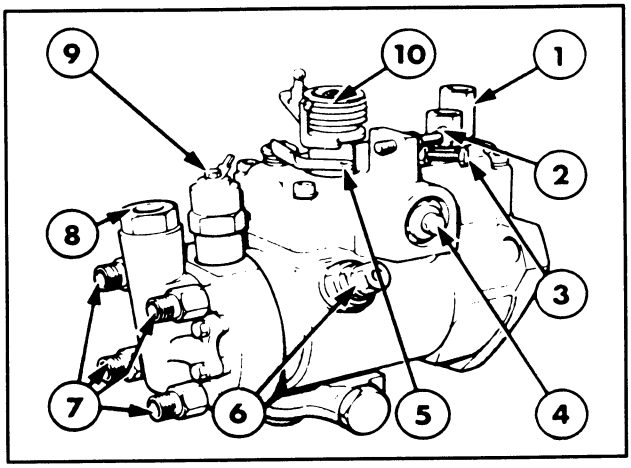
FUEL INJECTION PUMP – DESCRIPTION AND OPERATION

The DPS distributor type fuel injection pump, A, Figure 2A-1, is installed on the 9030 tractor.

The pump is flange mounted at the right front side of the engine. It is driven by a gear timed to the crankshaft drive gear. See "Engine Systems", Section 1. It is oil tight, having a double lip type seal, preventing engine oil from entering the pump body and also fuel oil from entering the engine lubrication system.

During operation all moving parts are lubricated by fuel oil under pressure preventing the ingress of dust, water and other foreign material.

Although any disassembly, repair, and reassembly of the fuel injection pump would be done by a Lucas CAV Authorized Service Distributor (ASD), it is important to be familiar with the pump components and how they operate.



DPS Fuel Injection Pump — Figure 2A-2

1	Return Connector	6	Latch Valve
2	Maximum No-Load Speed Adjuster	7	Outlets to Injectors
3	Idle Speed Adjuster	8	Fuel Inlet Connector
4	Excess Fuel Device	9	Fuel Shut-Off Solenoid
5	Stop Control	10	Throttle Lever

FUEL INJECTION PUMP – EXTERNAL COMPONENTS

Figure 2A-2 shows the external components of the DPS pump.

The governor housing, in the forward section of the pump, encloses the mechanical governor.

The pumping/distribution system is to the rear.

On top of the governor housing is the housing cover, which holds the throttle control lever. This lever operates against the maximum no-load speed adjuster and idle speed adjuster. The mechanical fuel shut-off lever is below the throttle control lever.

On one side of the governor housing is a bore for the excess fuel device. The maximum fuel setting screw is directly opposite the excess fuel device bore, on the other side of the pump. The rotor

TIMING SYSTEM

Figure 2A-6

The housing bolted to the underside of the injection pump works (through a spring and servo arrangement) on the small spherical bearing that is screwed into the bottom of the cam ring. In this way. it rotates the cam ring a few degrees to advance or retard injection timing.

The timing system is spring-retard and pressure-advance. When the tractor is stopped, timing is automatically fully retarded into the start-retard position. When the tractor is started and there is transfer pump pressure, the servo in this housing is moved against spring pressure to advance the timing. Initially, the servo is moved against a light spring for idle advance. Secondarily, it is moved against a heavy spring for high speed advance.

A double set of springs (light and heavy, Figure 2A-6) on the plunger operate in tandem. In operation, timing should cause start-up fuel delivery to occur at approximately top dead center (TDC) at full start retard; at about 8° crankshaft rotation before top dead center (BTDC) when the light spring is collapsed; and somewhere between 16° and 18° BTDC when the heavy spring is compressed for full advance.

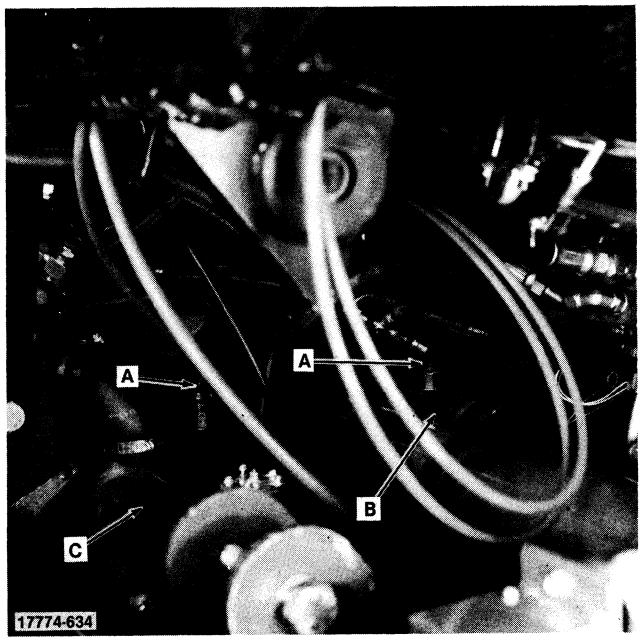
The timing retard servo system is controlled by the latch valve. Recall that fuel can go in one of two directions from the transfer pump.

To the metering valve, from which fuel can go to the main pumping and distribution system.

To the latch valve, from which fuel can go to the timing advance circuit and the excess fuel disable circuit.

The latch valve, then, is a decisionmaker, Figure 2A-15. It is a pressure-operated valve that opens at approximately 35 psi (2.4 bar) and allows the transfer pump pressure to be delivered to the excess fuel disable servo. Thirty-five psi (2.4 bar) corresponds to transfer pump pressure as the engine starts and approaches low idle. The latch valve will not open until the engine has started and self-sustained (that is, operates without starter assistance).

As the engine starts and approaches idle speed, the latch valve opens. Pressure can then go to disable the excess fuel mechanism and to advance timing to normal at low idle, 8° BTDC.



Breather Lines **Figure 2B-5**

A Breather lines
B Fuel tank — right
C Fuel tank — left

10. Remove the breather lines, A, Figure 2B-5, at each tank connection.

11. Slide the left fuel tank rearward and to the center and remove it. Then remove the right tank in a similar manner.

Inspection

Inspect the fuel tanks for cracks, broken projections and wear on the strap contact points. Replace the tank if required.

FUEL TANK — INSTALLATION

1. Install the fuel gauge sender in the left tank with the float pointing toward the cab end axle and parallel to the tractor center line. Secure with the hardware removed.

2. Set the right tank in place and then the left tank.

3. Install the hanger straps on the fuel tanks and install the retaining nuts, A, Figure 2B-3.

4. Install the crossover tube, B, Figure 2B-2, and secure with the hose clamps, C.

5. Install the fuel supply line, A.

6. Install the fuel return line, D, in the front corner of the right fuel tank.

7. Install the cab end drive axle and drive shaft. See "Drive Axles", Section 7, in this manual.

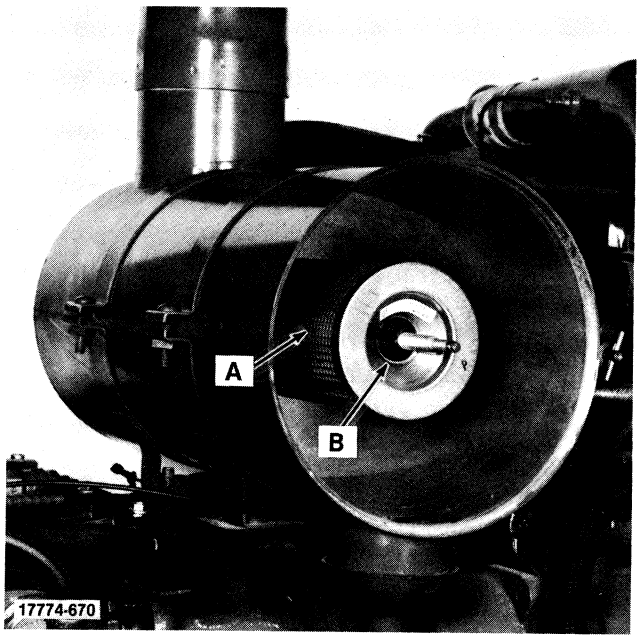
8. Install the breather lines, A, Figure 2B-5, at each tank connection. Connect the fuel gauge sender ground and electrical leads.

9. Install the filler tube and secure with the hose clamp, B, Figure 2B-4, and U-clamp, C.

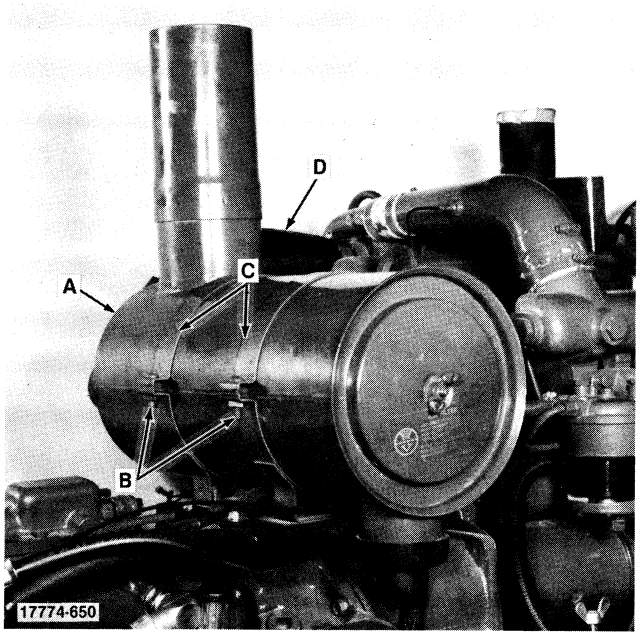
10. Remove the cab support tool FNH01033 and lower the cab. Install the cab mounting bolts. See "Cab, Seat, Frame and Environmental", Section 11, in this manual.

11. Fill the fuel tanks with clean fuel.

12. Bleed the fuel system. See "Bleeding the Fuel System" in this section. Start the tractor and correct any fuel leaks.



Inner Element **Figure 2C-12**
A Inner element
B Wing nut



Air Cleaner **Figure 2C-13**
A Air cleaner housing
B Nuts
C Clamps
D Outlet tube

Inner Element

3. Clean the inside of the air cleaner housing with a lint free cloth.

4. Remove the wing nut, B, Figure 2C-12, and slide the element, A, from the air cleaner housing.

Thoroughly clean the outer element. The inner element must be replaced yearly. See "Operator's Manual - Bidirectional Tractor, 9030" for specific instructions.

AIR CLEANER ELEMENT — INSTALLATION

Inner Element

1. Insert the element, A, Figure 2C-12, into the air cleaner housing. Be sure the seal on the end of the filter contacts the air cleaner housing all the way around.

2. Install the wing nut, B. Tighten securely.

Outer Element

3. Install the outer element in the air cleaner housing. Be sure the element contacts the air cleaner housing all the way around.

4. Install the seal and the cover. Tighten the wing nut securely.

AIR CLEANER HOUSING — REMOVAL

1. Remove the air cleaner cap and muffler.

2. Remove the hood and side panels.

3. Remove the electrical leads from the restriction lamp switch.

4. Loosen the outlet tube hose clamp, D, Figure 2C-13.

5. Remove the bolts and nuts, B, from the clamps, C.

6. Open the clamps and remove the air cleaner housing.

AIR CLEANER HOUSING — INSTALLATION

1. Open the clamps, C, Figure 2C-13, and set the air cleaner housing in place.

2. Install the bolts and nuts in the clamps and tighten securely.

3. Attach the restriction lamp switch electrical leads.

4. Install the outlet tube hose and tighten the hose clamp securely.

5. Install the hood, side panels, muffler and air cleaner cap.

1. Inspect the cylinder to see whether it is empty. An empty cylinder weighs 510 g (18 oz.).
2. Remove the atomizer, 1, and capillary tube, 2, from the engine. Connect the atomizer to the tube.
3. Bypass the Thermoguard™ sensor, 3, with a jumper wire. Activate the system. The atomizer should emit a fine spray of ether.
4. If no ether sprays from the atomizer, remove the atomizer and try again. If ether comes out of the tube, replace the atomizer.
5. If no ether comes out of the tube, remove it and activate the system. If ether discharges from the valve, 4, without the tube attached, replace the tube.
6. If no ether discharges from the valve, remove the ether cylinder. Activate the system. The plunger should move up until the switch is released.
7. If the valve does not function, the problem is electrical. Refer to Section 3 - Electrical System.

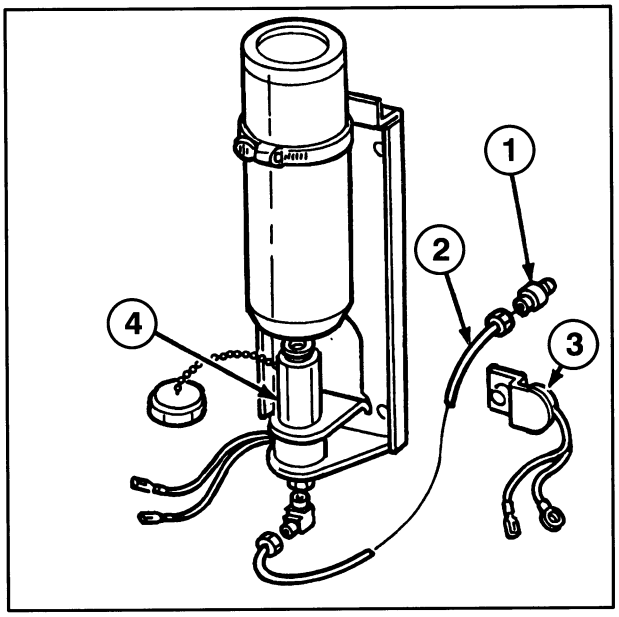


Figure 2D-7

Replacing the Ether Cylinder

1. Clean the area around the ether cylinder and valve.
2. Loosen the clamp, 1, securing the cylinder to the bracket.
3. Turn the cylinder, 2, counterclockwise to remove it. Install a protective cap in the valve.
4. Inspect the valve gasket. Replace it if it is damaged or worn.
5. Install a new ether cylinder, threading it hand-tight to seat the valve.

   NOTE: The cylinder must only be hand-tight. The valve will not operate if more than one gasket is used.

6. Install the clamp and tighten it securely.

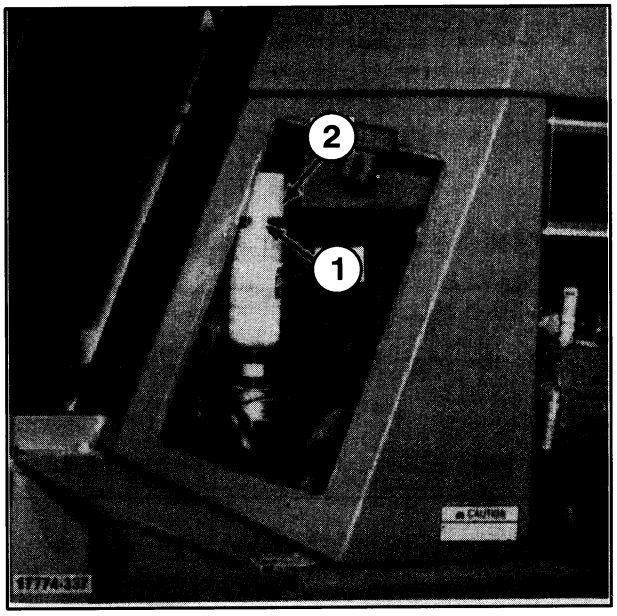


Figure 2D-8

CAUTION: IN CASE OF ETHER ODOR, BRUSH SOAPY WATER OVER THE SUSPECTED LEAK AREA(S) TO FIND THE LEAK.

Reassembly

Reassembly of the fuel filter is the reverse of disassembly, but observe the following requirements:

1. Position the sealing rings correctly.
2. Tighten the fuel filter body to the correct torque.

Installation

1. Reinstall the filter assembly and tighten the bolts to the correct torque.
2. Bleed the fuel system.

SEDIMENTER

Removal

1. Close the fuel shutoff tap on the fuel tank.
2. Disconnect and remove both fuel lines from the head of the sedimenter assembly, 1.
3. Loosen and remove the retaining bolts and remove the sedimenter assembly from the engine.

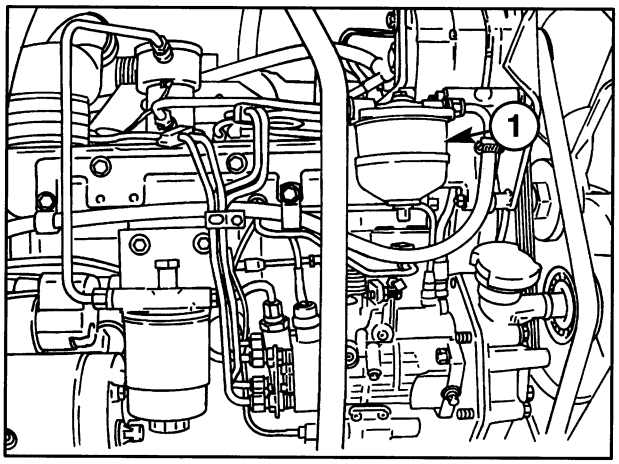


Figure 2D-25

Disassembly

Dismantle the body of the sedimenter by removing the top screws.

Reassembly

Reassembly of the fuel sedimenter is the reverse of disassembly, but observe the following requirements:

1. Tighten all retaining bolts to the correct torque.
2. Bleed the fuel system.

Removal

1. Loosen the high pressure fuel pipe gland nuts, 1, at the injection pump.
2. Clean the area around the injectors.
3. Remove the banjo bolts, 2, and discard the two copper washers from each bolt. Remove the leak-off pipe, 3
4. Unscrew the gland nuts and disconnect the high pressure pipes, 4, from the injectors.

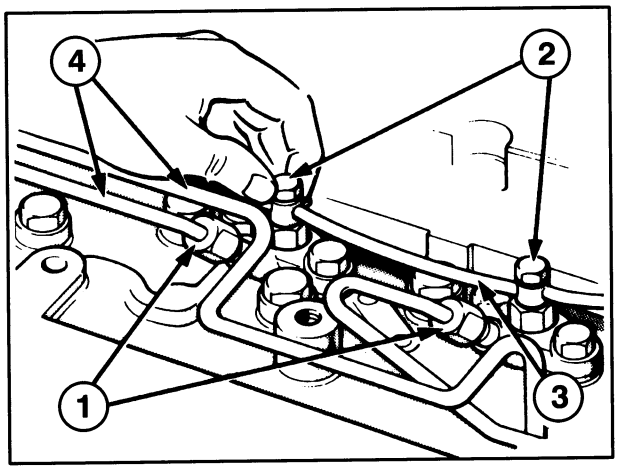


Figure 2D-35

5. Unscrew and remove the two retaining bolts, 1, from each injector, 2, and remove the injector from the cylinder head.
6. Discard the cork dust washer, 3, and the copper sealing washer, 4.

   NOTE: The copper sealing washer may have to be extracted from the bore in the cylinder head.

7. If a replacement set of injectors is not immediately available, cover the ends of the pipes and the cylinder head openings to prevent the entry of dirt and foreign bodies.
8. To determine whether overhaul or replacement is necessary, test the injectors according to the following procedure. Before testing, install a protective cap to the inlet union and clean the outside of the injectors with a soft wire brush and a carbon solvent.

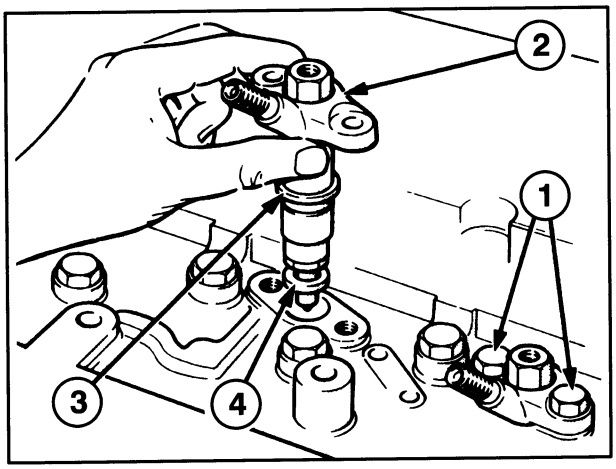


Figure 2D-36

IMPORTANT: Do not remove or disturb the inner safety element, 1, unless it is damaged or contaminated with dirt by a faulty outer element.

2. Unscrew the retaining locknut, 2, and remove the inner element.

OUTER FILTER HOUSING

Clean and examine the outer filter housing and repair or seal any damaged seams.

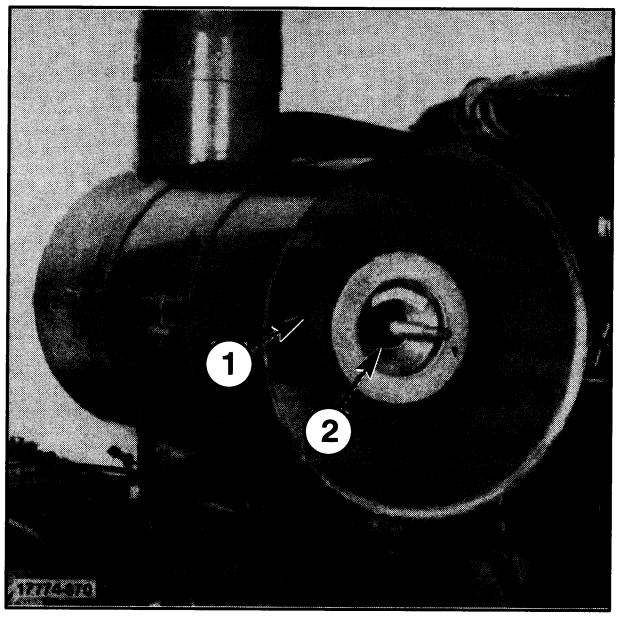


Figure 2D-55

OUTER ELEMENT

1. If dust is present inside the outer element, replace it. If not, clean the element by tapping both ends on the palm of the hand. Do not tap the element against a hard surface, as it will be damaged or distorted.

   A second cleaning option is to use compressed air, not exceeding 2 bar (30 PSI). Insert the air nozzle into the element and blow air through the element from the inside to the outside to loosen and remove dirt and dust. Blow loose particles from the outside of the element by holding the nozzle at least 152 mm (6″) from the element.

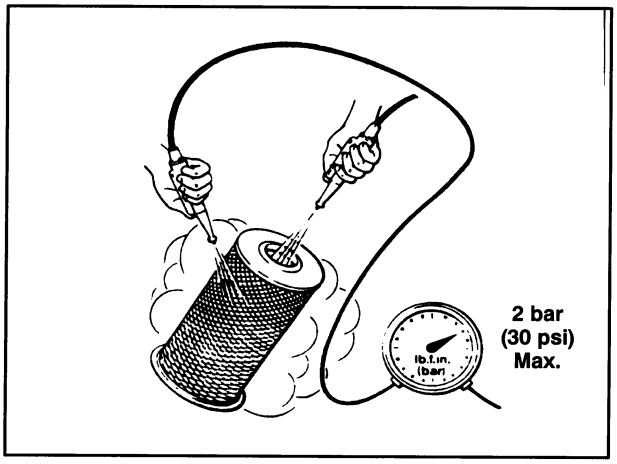


Figure 2D-56

CAUTION: WEAR EYE PROTECTION AND A FACE MASK WHEN CARRYING OUT THIS OPERATION.

If the filter element is undamaged, wash the element every 300 hours or after five dry cleanings.

IMPORTANT: Never use oil, fuel, or solvent. Use only warm water, not hotter than the hand can stand. Otherwise, the element may be damaged.

3. Inspect all mating surfaces and snap ring grooves to ensure that they are free of burrs, dirt, and corrosion.
4. Transfer the scribe marks from the old snap rings to the new ones and coat them lightly with new engine oil.
5. Install the oiled snap ring on the compressor end of the CHRA, with the beveled face toward the turbine end.
6. Install an O ring, 1, on the center housing compressor end flange and place compressor housing assembly in position. Be careful not to damage the compressor wheel blades.
7. Carefully rotate the compressor housing onto the CHRA to line up scribed marks.
8. Install the oiled snap ring, lug first, into the compressor housing groove. Be sure that the beveled side faces the turbine end and the scribe marks are aligned.
9. Tap the inner circumference or lug ends of the ring with an appropriately-sized drift to ensure proper seating.

   NOTE: When installing a new CHRA or turbine housing, transfer the scribed alignment marks from the old to the new parts.

10. Place the turbine housing, discharge side down, on a flat, level surface. Place the CHRA turbine wheel end into the housing. Use care to avoid damaging the wheel blades. Check visually for proper alignment.
11. Carefully rotate the CHRA in the turbine housing to line up the scribed marks. Recheck for proper alignment and position the locking plates.
12. Coat the bolts in a suitable non-seize compound and tighten to a torque of 20 - 25 N·m (15 - 18 ft lbs)

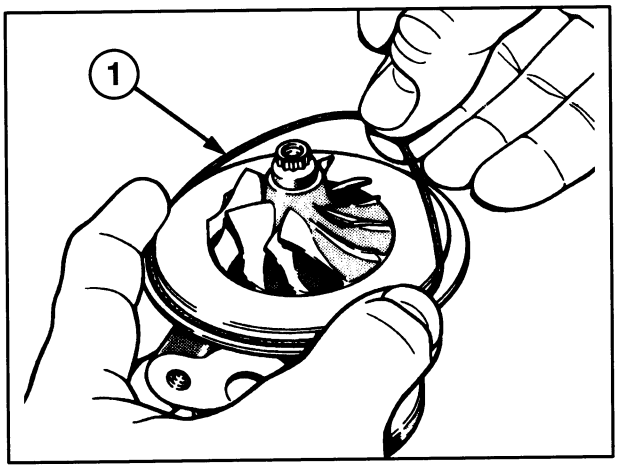


Figure 2D-69

PROBLEM	POSSIBLE CAUSES	CORRECTION
Oil pressure warning light fails to operate	Bulb burnt out	Replace bulb
	Warning light pressure switch faulty	Replace pressure switch
	Warning light circuit faulty	Check and replace wiring
Excessive exhaust smoke	Oil leak on compressor or turbine side of turbocharger, where fitted	Overhaul turbocharger
	Exhaust leak on exhaust manifold side of turbocharger, where fitted	Install new gasket
	Air cleaner dirty or restricted	Clean
	Excessive fuel delivery	Overhaul injection pump/ injectors
Water temperature gauge fails to reach normal operating temperature	Faulty temperature sender switch	Replace sender switch
	Incorrect or faulty thermostat	Replace thermostat
	Faulty water temperature gauge	Replace temperature gauge

SYMPTOMS	POSSIBLE CAUSES
Engine lacks power or emits black smoke	Dirty air cleaner See Notes A & H) Loose compressor to intake manifold connections (See Notes B & C) Leak at engine intake at turbocharger mounting flange (See Notes D, F. & G) Turbo rotating assembly binding (See Note K) Air cleaner to turbocharger duct restricted (See Note H) Compressor to intake manifold duct restricted (See Note H) Engine exhaust system restricted Engine malfunction (rings, pistons, valves, etc.)
Engine exhaust emits blue smoke	Dirty air cleaner See Notes A & H) Loose compressor to intake manifold connections (See Notes B & C) Leak at engine intake manifold (See Notes F) Plugged engine oil filter Restricted duct between air cleaner and turbocharger compressor (See Notes H) Seal leak at compressor end of turbocharger Engine malfunction (rings, pistons, valves, etc.)
Excessive engine oil consumption	Wrong type or viscosity of engine lubricating oil Seal leaks at compressor end of turbocharger (indicated by oil in housing or on wheel) Oil in engine exhaust manifold (caused by malfunction of rings, pistons, valves, etc.)
Noisy turbocharger	Dirty air cleaner (See Notes A & H) Foreign material or object in compressor to intake manifold duct (See Notes H) Foreign object in engine exhaust system Carbon buildup in turbine housing Turbocharger rotating assembly binding or dragging

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SECTION 3F – SPECIFICATIONS

General Electrical Data 3F-1

Figure 3-3 – Wiring Diagram
S/N D932000 – D200233

Panel 1 of 4
Engine and Junction Box Wiring

Figure 3-3 – Wiring Diagram
S/N D932000 – D200233

Panel 1 of 4
Engine and Junction Box Wiring

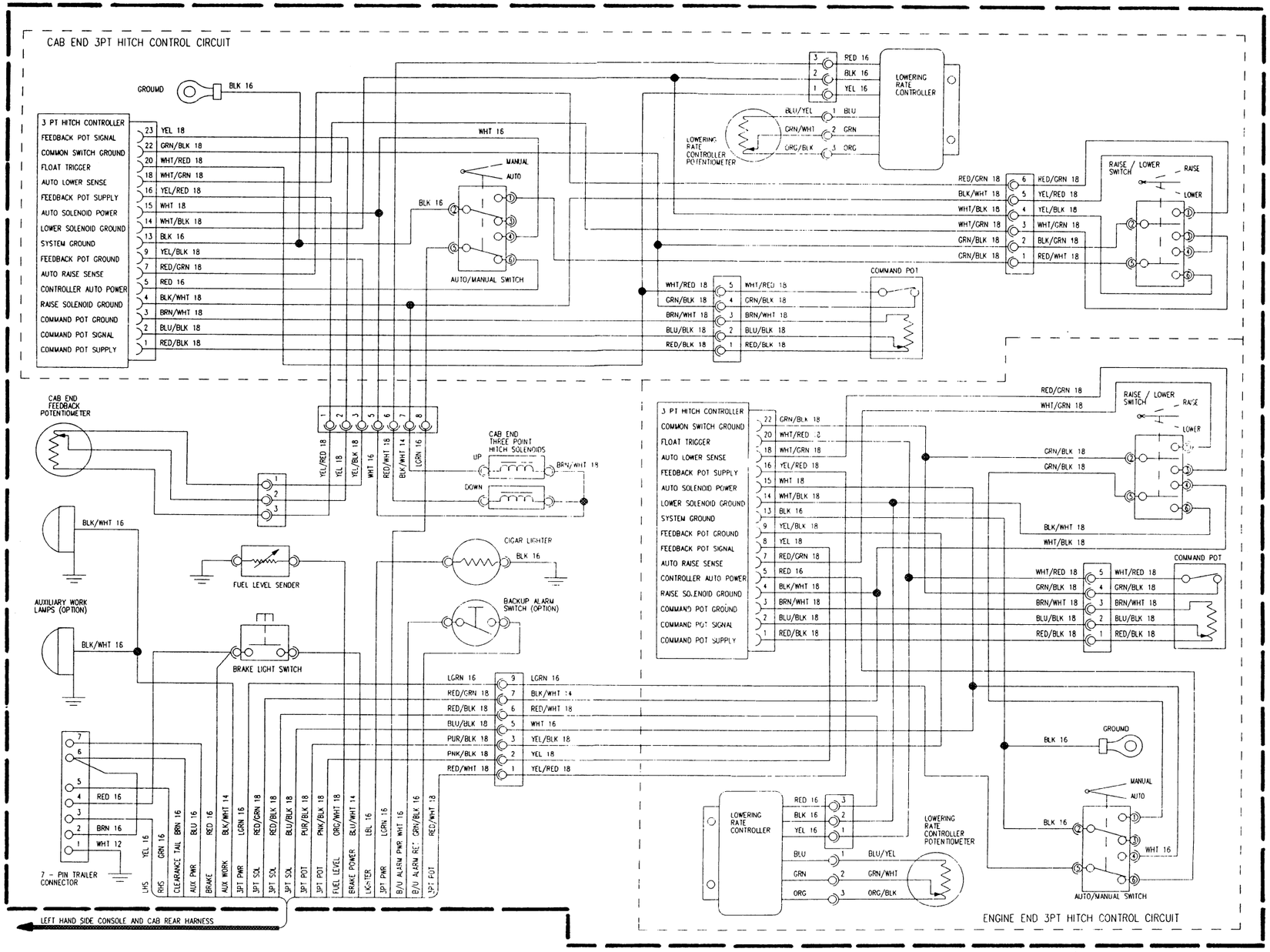
Figure 3-4 - Wiring Diagram
S/N D200234 - D202206

Panel 2 of 4
Junction Box Wiring

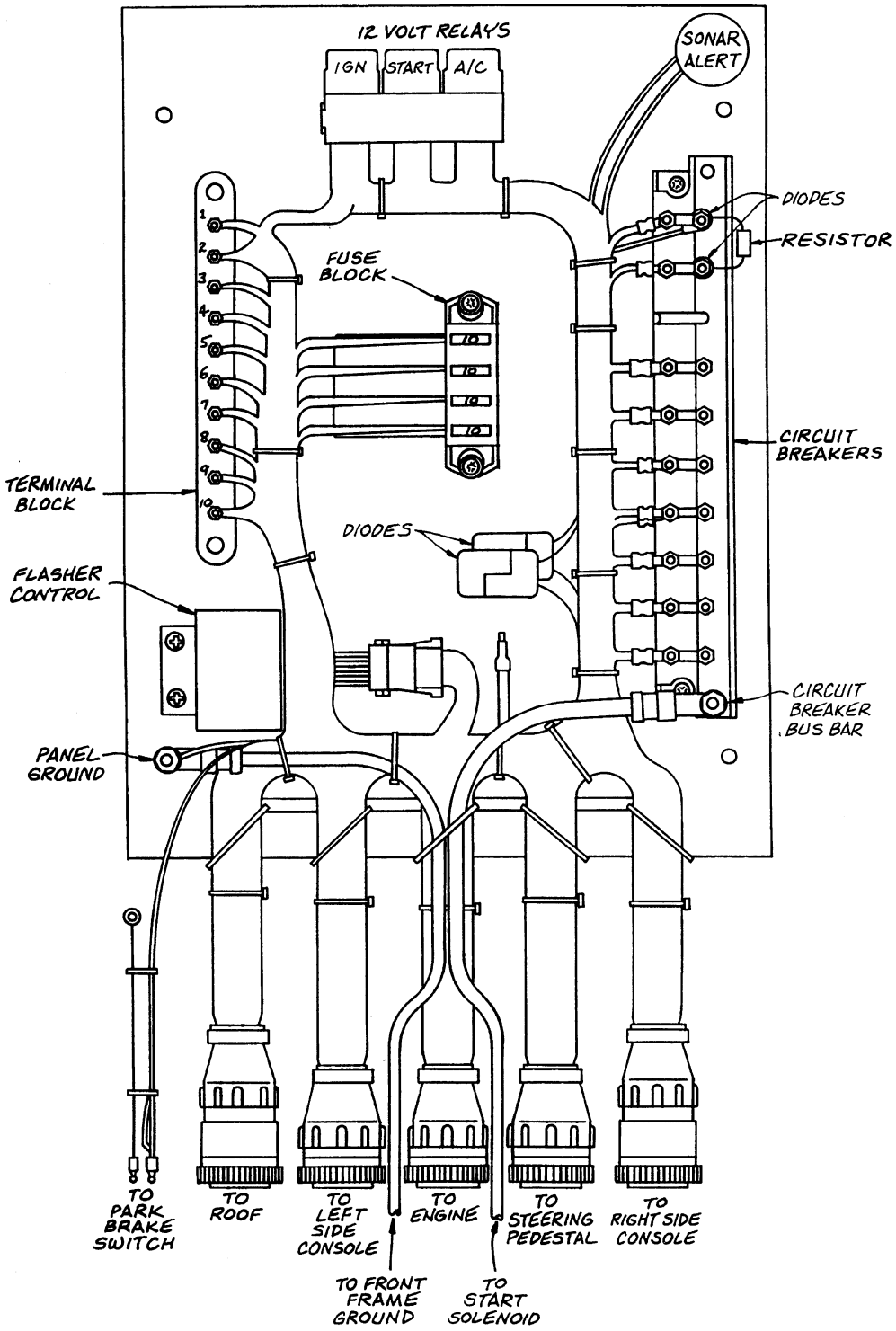
Figure 3-4 - Wiring Diagram
S/N D200234 - D202206

Panel 2 of 4
Junction Box Wiring

LHS CONSOLE WIRING HARNESS



9030 BIDIRECTIONAL TRACTOR WIRING DIAGRAM S/N D202207 - D202635



JUNCTION BOX HARNESS
S/N 0932000 TO D200233

FIGURE 3-8

TACHOMETER / SPEEDOMETER / HOURMETER TROUBLESHOOTING

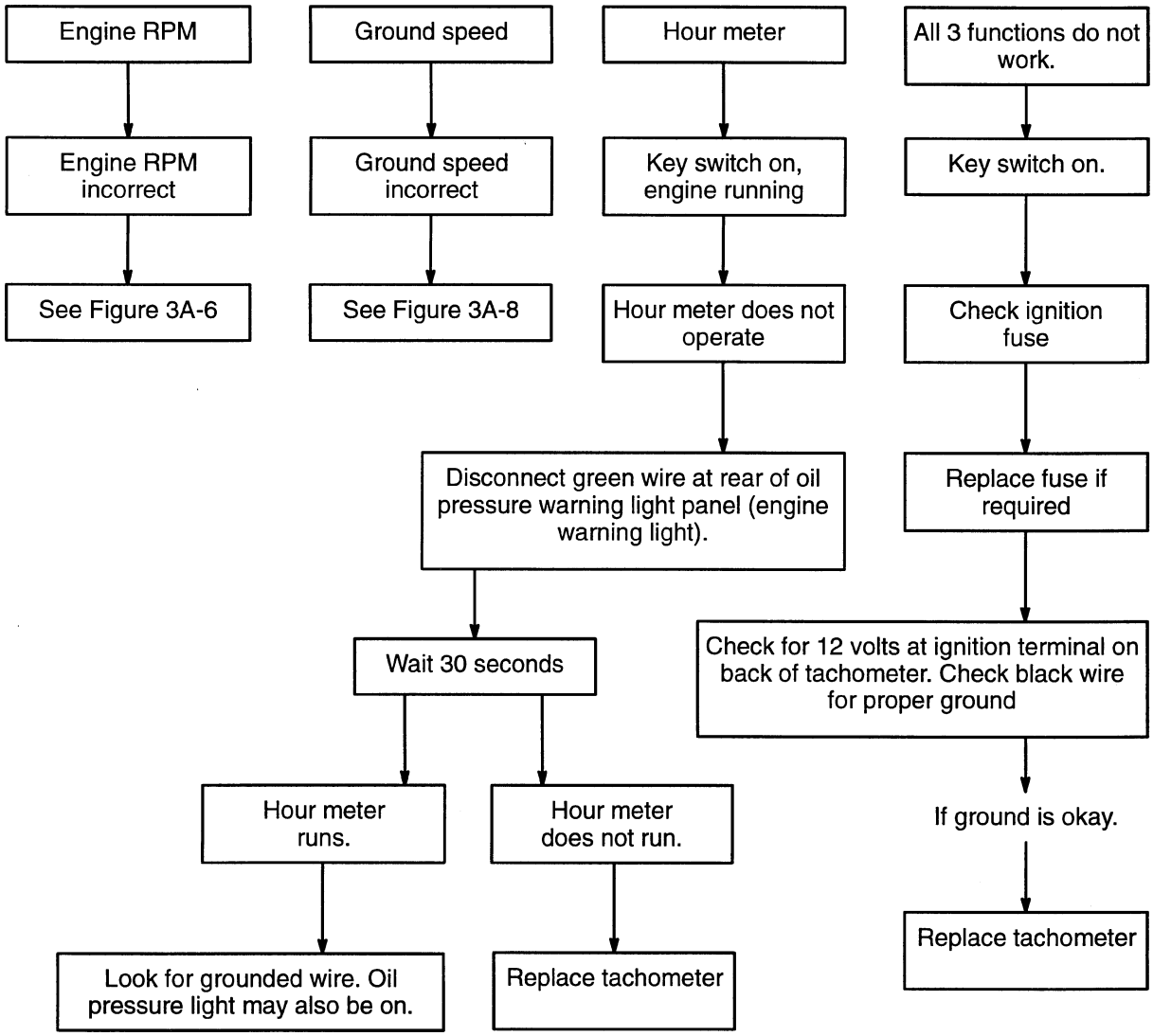


FIGURE 3A-5

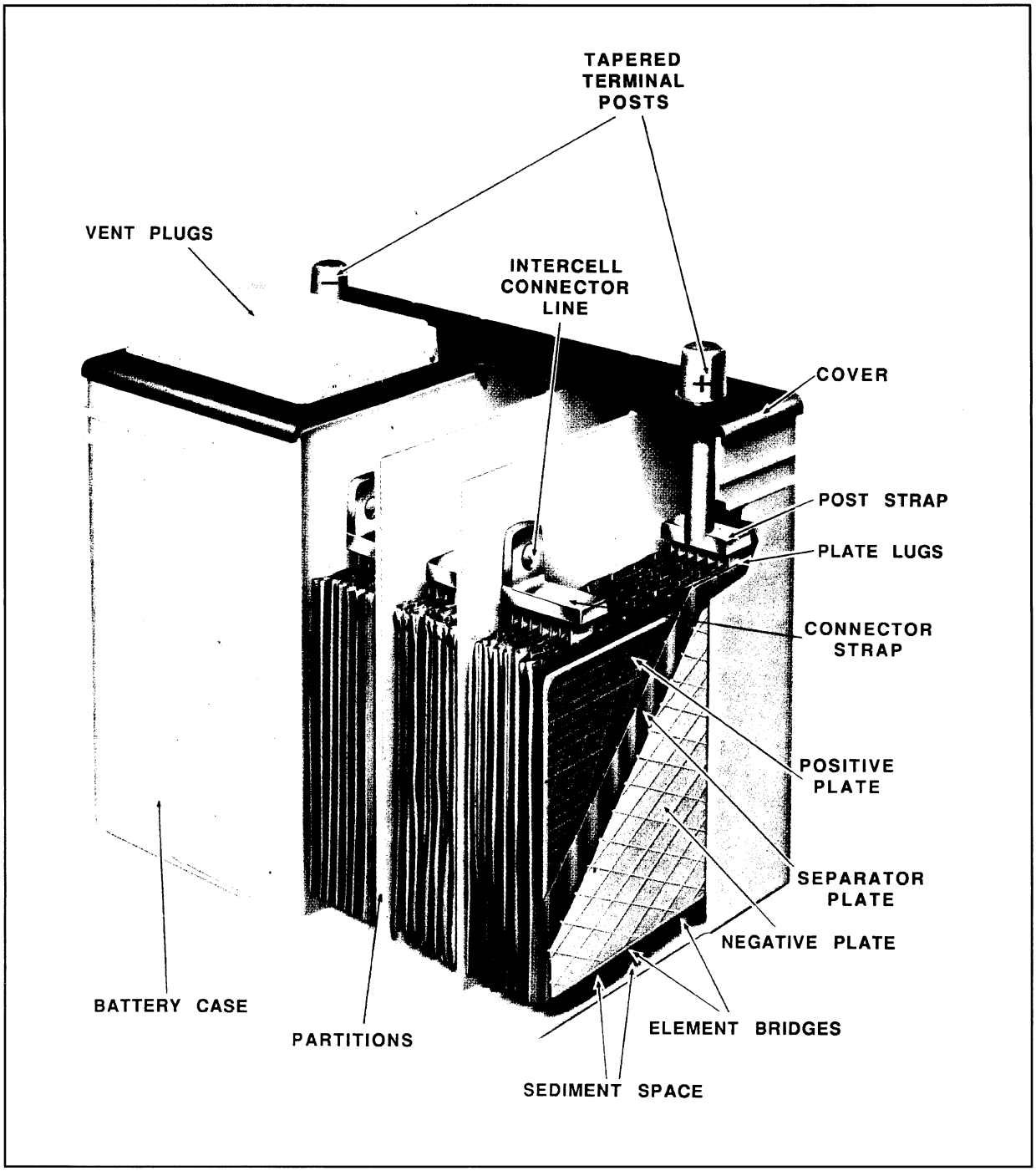

TAPERED TERMINAL POSTS
VENT PLUGS
INTERCELL CONNECTOR LINE
COVER
POST STRAP
PLATE LUGS
CONNECTOR STRAP
POSITIVE PLATE
SEPARATOR PLATE
NEGATIVE PLATE
BATTERY CASE
PARTITIONS
ELEMENT BRIDGES
SEDIMENT SPACE

FIGURE 3B-3

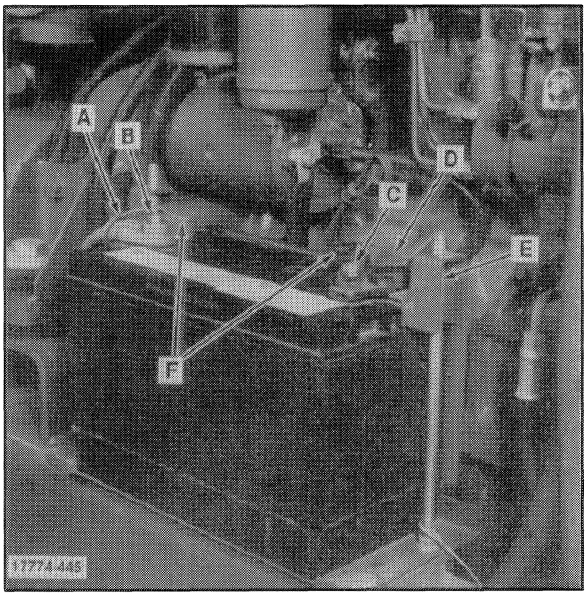


FIGURE 3B-10

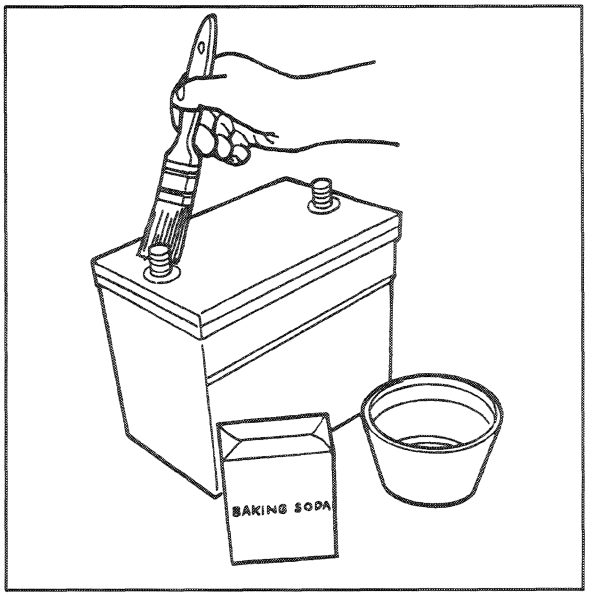


FIGURE 3B-11

2. Remove the plastic cover, F, and nut, C, Figure 3B-10, and remove the ground cable, D, from the battery post. No puller should be necessary to remove the cable.
3. Remove the plastic cover and nut, B, Figure 3B-10, and remove the positive cable, A, from the battery post.
4. Remove the hold down bracket, E, Figure 3B-10, and remove the battery.

Examine the battery for cracks and leakage. Replace if required. Clean the battery and neutralize any corrosion with a solution of baking soda and water, as shown in Figure 3B-11. Clean the battery cables and terminals using a wire brush, Figure 3B-12.

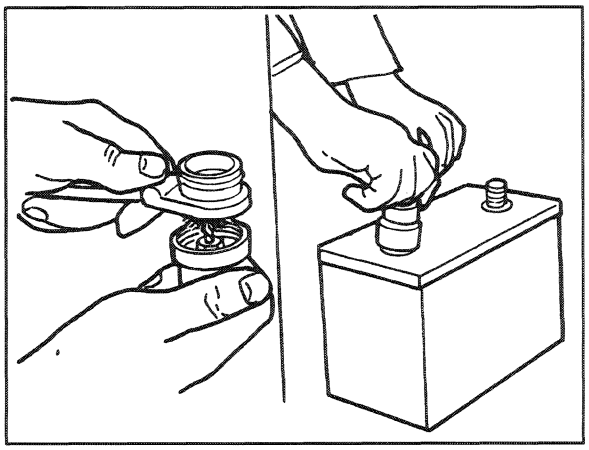


FIGURE 3B-12

BATTERY - INSTALLATION

1. Set the battery in place, and attach the hold down over the battery.
2. Install the positive cable, A, Figure 3B-10, tighten nut, B, and install the plastic cover.
3. Install the ground cable, D, Figure 3B-10, and nut, C, tighten the nut securely and install the plastic cover.
4. Install cover, B, Figure 3B-9, and secure with wing nuts, A.

Brush Removal and Installation

1. Unsolder the field brush leads from the field coils.
2. Unsolder the ground brush leads from the brush holders.
3. Install the new brushes, soldering the leads using a 300 watt soldering iron and resin core solder.
4. Ensure the new brushes move freely in the holders. If necessary, smooth the sides of the brushes with a fine abrasive, or a file.

Armature Assembly and Armature Bushing

1. Inspect the armature for damage to the core and wire areas. If damaged, install a new armature; do not attempt to machine the core.
2. Using "Vee"-blocks and a dial indicator, check the armature shaft runout. Install a new armature, if the runout is greater than 0.005" (0.127 mm) maximum.
3. Examine the armature shaft bushing in the brush end plate. If the bushing is worn, or scored, install a new bushing.
4. Inspect the brake shoes in the brush end plate. If worn, or damaged, install new parts.
5. Inspect the bushing in the inner plate, if worn, or scored, install a new bushing.
6. Inspect the bushing in the drive end housing, If the bushing is worn, or scored, install a new bushing.
7. Clean the commutator with a suitable solvent, and inspect the surface for pits and burned spots.
8. Using "Vee"-blocks and a dial indicator, check the commutator runout. If the runout is more than 0.005 (0.127 mm). turn down the commutator using a lathe and a sharp cutting tool. Rotate the armature at a high speed and take light cuts with the tool. then polish the surface with emery cloth.

   NOTE: Do not reduce the diameter of the commutator less than 1.53 (38.89 mm), or a new armature must be installed. The insulation slots must not be undercut.

9. Perform the armature ground test.

Field Coils

Check the field coils for open, or grounded circuits. If faulty, install new coils as follows:

1. Un-solder the field coil leads form the field terminal.
2. Un-solder the eyelet cable from the field coil connections.
3. Remove the pole shoe screws.
4. Remove the insulation band.
5. Remove the pole shoes and field coils from the starting motor frame.
6. Position the new field coils over the pole shoes and place the coils in the starting motor frame.
7. Place the insulation band in position.
8. Install the pole shoe retaining screws. While tightening the screw, tap the starting motor frame with a soft-faced hammer to align and set the pole shoes. Once installed, stake the screws to prevent them from loosening.
9. Re-solder the field coil leads to the starting motor field terminal using resin core solder.
10. Re-solder the eyelet cable connections.
11. Check the field coils for grounding.

Drive Assembly

Check the operation of the roller clutch in the starter drive. If the pinion is stuck, or rotates in both directions, or if the pinion teeth are damaged, install a new drive assembly.

If damaged pinion teeth are evident, check the flywheel ring gear teeth, see "ENGINE SYSTEM" in this manual.

Charge Indicator Lamp - Normal Operation

Check the charge indicator lamp for normal operation as follows:

Ignition Switch	Lamp	Engine
Off	Off	Stopped
On	On	Stopped
On	Off	Running

If the alternator indicator lamp fails to operate properly, follow the procedures as described by the following examples:

1. Ignition switch "ON", engine off, indicator bulb will not illuminate.
   a. Check bulb - if burned out, replace.
   b. Unplug terminal #1 and #2 connector at the alternator. Ground out gray 16 gauge wire. Lamp should light. If it does, the problem is with the regulator inside the alternator, see "Testing the Alternator" in this section. If the lamp does not illuminate, check back through the lamp circuit, as shown in Figure 3D-3, for a broken circuit wire, or poor connection. Repair as necessary. There must be battery voltage at the ignition terminal of the ignition switch when it is in the "ON" position. Also, there must be continuity from the ignition terminal all the way to terminal #1 at the alternator.
2. Ignition switch "ON", engine running, indicator bulb constantly on.
   a. Check the alternator output, as described in "Testing the Alternator" in this section. If no output, repair, or replace the alternator.
   b. If the alternator is working properly, turn the engine off. Turn the ignition switch to the "run" position. Unplug the #1 terminal and #2 connector at the alternator. The lamp should go out. If it does, there is an internal problem with the alternator, see "Alternator Disassembly" in this section.

      If the lamp does not go out, there is a short to ground in the lamp illumination circuit. Refer to Figure 3D-3, and check back through the lamp circuit to find a possible short to ground. With the ignition switch off and the alternator #1 and #2 terminal plug unhooked, there should be no continuity to ground in the lamp circuit.

Testing the Alternator Output and Alternator Circuit

Checking Circuit Parameters

In order for the charging system to work properly, the following must be correct in the complete circuit:

1. Ignition switch "ON", engine off
   - Battery voltage present at "Batt" terminal on alternator with all connections hooked up to the alternator.
   - Battery voltage present at #2 terminal on alternator with all connections hooked up to the alternator.
   - Between 1-2 volts present at terminal #1 with all connections hooked up to the alternator.
2. Ignition switch "ON", engine off
   - Slightly less than battery voltage at gray wire (terminal #1 wire) at alternator when terminal #1 and #2 connectors are unhooked from the alternator.
   - Battery voltage at red wire (terminal #2 wire) at alternator when terminal #1 and #2 connector are unhooked from the alternator.
   - Check the excitation and lamp illumination circuit, and measure its parameters with the following information:

   A. Approximately 0.6 volts present at terminal #1 on the alternator with all connections hooked up, and the 47 ohm resistor disconnected from the circuit in the junction box.

   B. Approximately 0.8 volts present at terminal #1 on the alternator with all connections hooked up, and the red/black 18 gauge wire unhooked from the circuit in the junction box.

   NOTE: Remember, it is possible to have correct alternator output with a "burned out" charge indicator bulb in the tractor's dash. This is due to the "redundant" alternator field activation circuit. If both the bulb and the 47 ohm resistor are not functioning, the alternator will not charge, see Figure 3D-3.

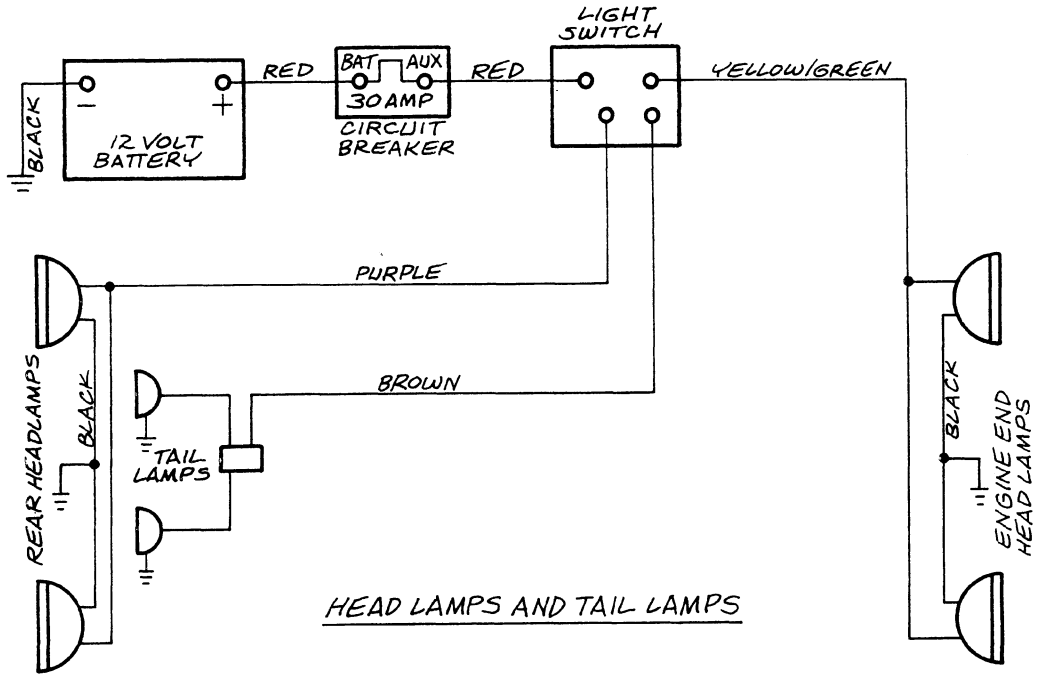

LIGHT SWITCH
RED
BAT
AUX
30 AMP
CIRCUIT BREAKER
RED
YELLOW/GREEN
BLACK
12 VOLT BATTERY
PURPLE
BROWN
REAR HEADLAMPS
BLACK
TAIL LAMPS
BLACK
ENGINE END HEAD LAMPS
HEAD LAMPS AND TAIL LAMPS

FIGURE 3E-2

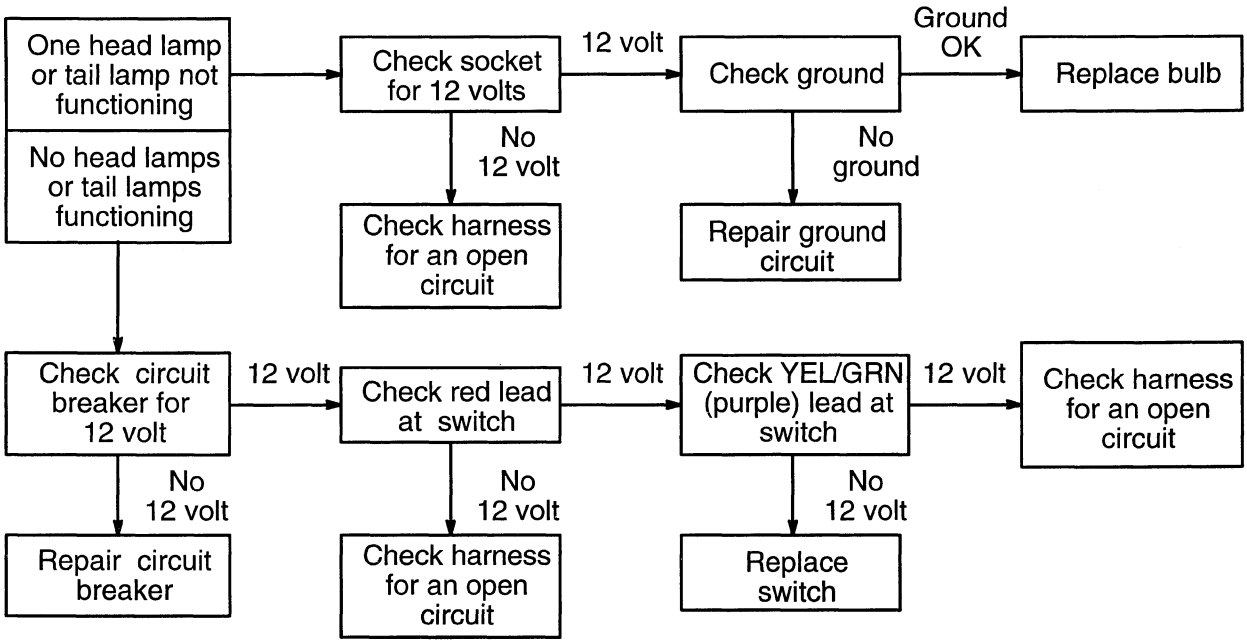

One head lamp or tail lamp not functioning
No head lamps or tail lamps functioning
Check socket for 12 volts
12 volt
Check ground
Ground OK
Replace bulb
No 12 volt
Check harness for an open circuit
No ground
Repair ground circuit
Check circuit breaker for 12 volt
12 volt
Check red lead at switch
12 volt
Check YEL/GRN (purple) lead at switch
12 volt
Check harness for an open circuit
No 12 volt
Repair circuit breaker
No 12 volt
Check harness for an open circuit
No 12 volt
Replace switch

Figure 3E-8 shows the windshield wiper circuit and troubleshooting chart which is helpful when repairing concerns in this area.

Wiper Motor - Removal, Front

1. Remove the six screws and remove the cab filter housing and filter.
2. Mark, and remove the electrical leads from the wiper motor.
3. Remove the nut securing the parallel arm to the stud.
4. Remove the wiper arm nut, A, Figure 3E-9, wiper arm, B, drive cone, C, rubber seal, D, and washer and nut, E, from the wiper drive shaft.

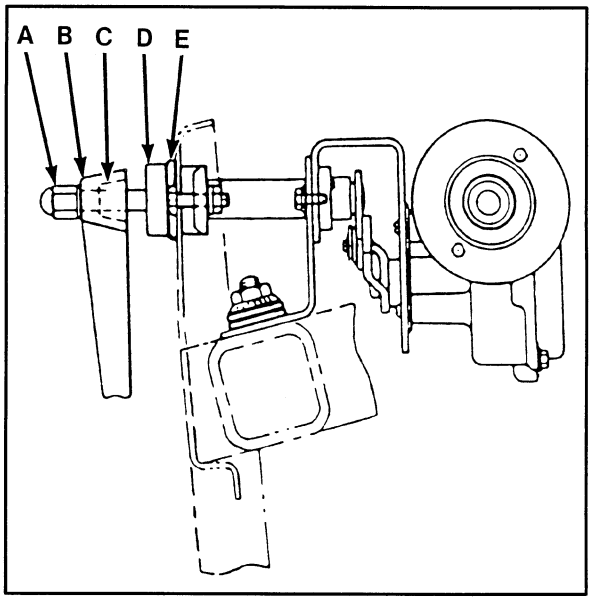


FIGURE 3E-9

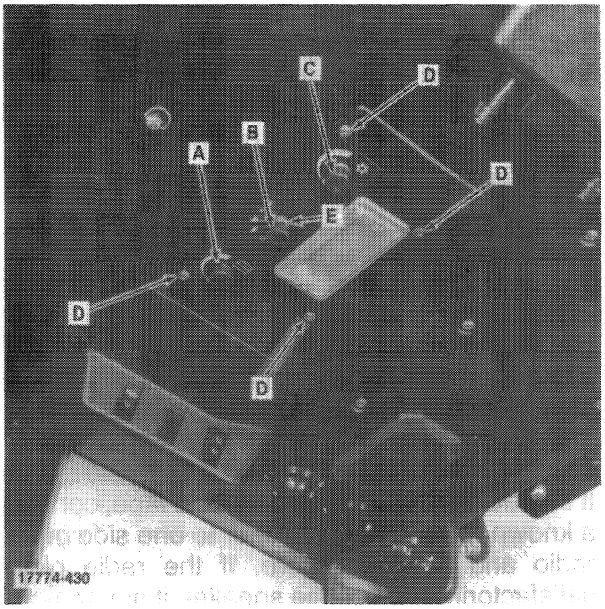


FIGURE 3E-19

Radio - Installation

1. Insert the radio in the inner roof, and secure with the hex nuts and spacers removed.
2. Attach the antenna and electrical connector.
3. Install the cab inner roof. See "Cab, Seat, Frame and Environmental" Section 11, in this manual.
4. Install the radio knobs.

HEATER/AIR CONDITIONER, BLOWER MOTOR AND SWITCH

The heater/air conditioner, blower motor and switch, control the amount of fresh air available to the cab. The blower switch, B, Figure 3E-19, is located in the cab inner roof adjacent to the dome lamp. The blower motor, and blower, are located in the cab roof.

The power for the blower switch originates at the A/C 30 amp circuit breaker in the junction box, Figure 3E-1. From the circuit breaker, the power travels, via a black 12 lead, to the A/C relay, and on to the blower switch. The blower switch also supplies power for the A/C compressor clutch.

NOTE: Figure 3E-1 represents junction box wiring for 9030 tractors, S/N D470100 - D488289. The tractor being worked on may have a slightly different junction box layout, but component location inside the box is the same, regardless of the tractor serial number.

If the blower motor fails to function, check for a 12 volt signal at the 30 amp A/C circuit breaker, Figure 3E-1. If a signal is NOT present, remove the lead, E, from the A/C circuit breaker for thirty seconds, and check once more. If a signal is still NOT present, replace the circuit breaker. If a signal is now present, check the harness for a short circuit.

NOTE: Make sure the circuit breaker is receiving 12 volt power from the heavy red cable attached to the bottom of the circuit breaker strip. The breakers all share the same power source and are connected to the buss bar power supply.

If a signal was present originally at the circuit breaker, replace the A/C relay with one of known quality. The A/C relay is on the right of the three relays (2nd from the right on tractors above S/N D200233). After replacing the relay, if the blower will NOT function, remove the heater temperature control knob, A, Figure 3E-19, and four cap screws, D. Lower the panel, and probe the black 12 lead on the blower switch with a 12 volt test lamp. If a signal is NOT present, examine the harness for an open circuit. If a 12 volt signal is present, rotate the blower switch to the "PURGE" position. Probe the red, yellow, and orange leads at the blower switch. If a 12 volt signal is NOT present on all three leads, replace the blower switch.

If a 12 volt signal is present, probe the lead going to the blower motor at the resistor block. If a 12 volt signal is present, determine the blower motor has a good ground and if so, the blower motor is defective and must be replaced. If a 12 volt signal is NOT present, replace the resistor block.

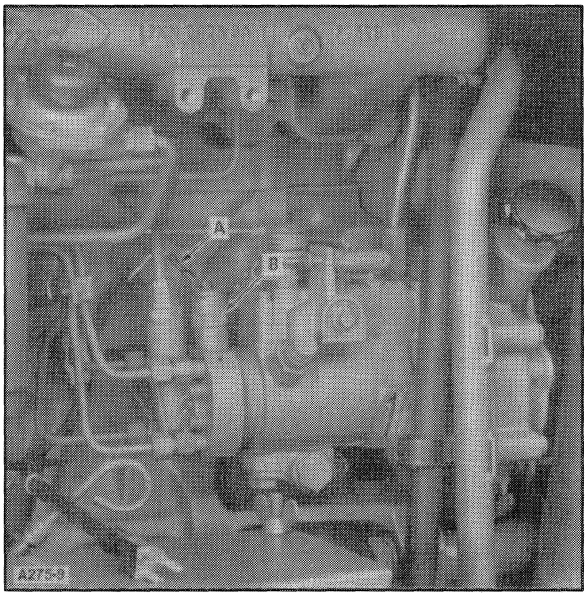


FIGURE 3E-29

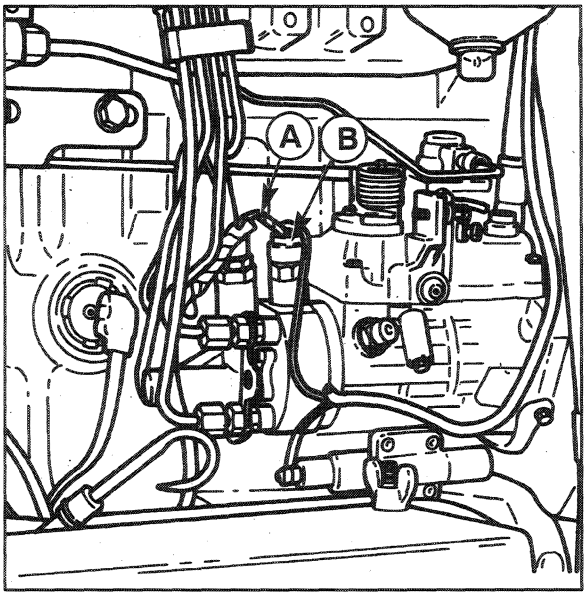


FIGURE 3E-30

FUEL SOLENOID VALVE

The fuel solenoid valve, B, Figure 3E-29 for the 9030 and Figure 3E-30 for the 9030E, allows the fuel to flow to the engine when the ignition switch is in the "ON" and "START" positions. When the ignition switch is rotated to the "OFF" or "ACC" positions, the valve closes and the fuel to the engine is shut-off.

The power for the fuel solenoid valve originates at the ignition switch, and flows to the ignition relay. If the ignition relay is closed, the power flows to terminal #1 of the terminal block, to the 10 amp fuse, and on to the fuel solenoid valve, via the orange 16 wire, A, Figure 3E-29 for the 9030 and Figure 3E-30 for the 9030E.

NOTE: On 9030 tractors, above S/N D932002, the fuel solenoid supply wire (orange 16) goes to the #8 position on the terminal block, and then onto the fuel solenoid.

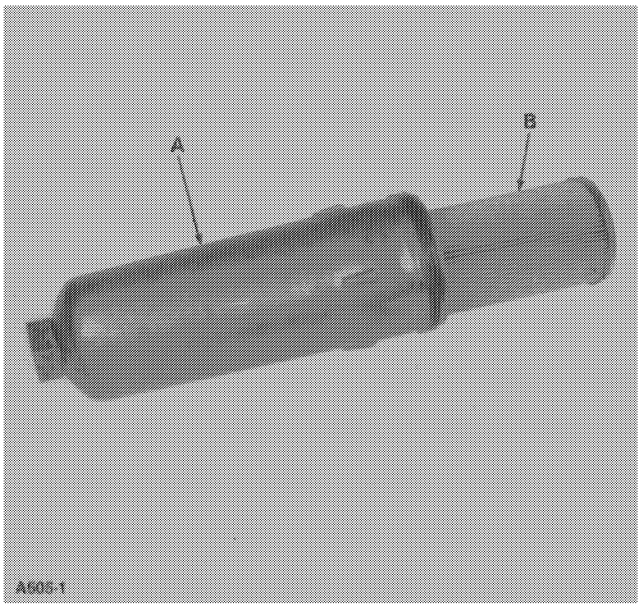
If the engine will not start and the fuel solenoid valve is suspect, connect a jumper wire, minimum 16 gauge, direct from the battery positive post to the fuel solenoid valve, B, Figure 3E-29 for the 9030 and Figure 3E-30 for the 9030E. If the solenoid does not activate, replace the fuel solenoid valve. See "Fuel System", Section 2 in this manual.

If the solenoid operates, remove the jumper wire and check for a 12-volt signal at terminal #1 of the terminal block in the junction box. If a 12-volt signal is present, check the fuse for an open circuit. If a 12-volt signal is NOT present, replace the ignition relay with one of known quality, then try once more.

If a 12-volt signal is present, permanently replace the ignition relay. If a 12-volt signal is NOT present, check the orange 16 lead at the ignition switch. If a 12-volt signal is present, examine the harness for an open circuit. If a 12-volt signal is NOT present, replace the ignition switch.

SPLITTER BOX 5-121
REMOVAL 5-121
SPLITTER BOX WITH MECHANICAL PTO - DISASSEMBLY 5-122
SPLITTER BOX WITH MECHANICAL PTO - ASSEMBLY 5-125
SPLITTER BOX WITH ELECTRO/HYDRAULIC PTO - DISASSEMBLY 5-128
SPLITTER BOX WITH ELECTRO/HYDRAULIC PTO - ASSEMBLY 5-131
INSTALLATION 5-133

SPECIFICATIONS 5-135



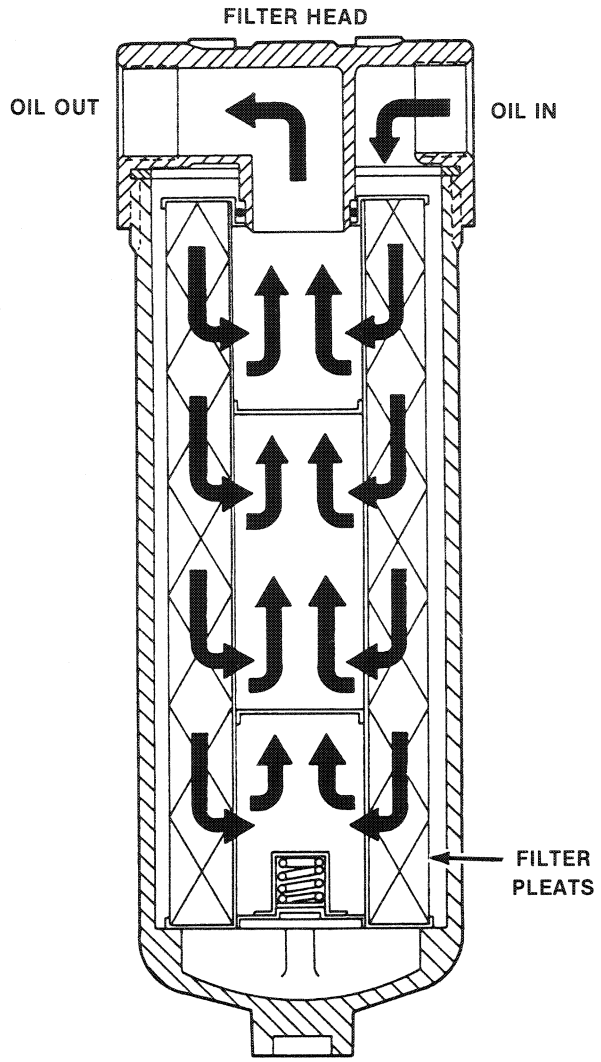
Hydrostatic Suction Filter **Figure 5-7**
A Filter body
B Filter element

Hydrostatic Pump Pressure Tests

Before beginning any four-gauge bar pressure diagnosis or troubleshooting tests always:

- Replace the element, B, Figure 5-7, of the suction filter, A, on the hydrostatic circuit.
- Remember that the oil entering the filter will pass through the filter pleats, pass through the filter center tube, and exit through the top of the filter. This action will trap contaminants in the outer folds of the filter pleats, Figure 5-8.
- Examine the old filter pleats for contamination. This is the first diagnostic indicator of system contamination. If severe contamination exists, it is more than likely the root of the problem.
- Flush a contaminated system before installing any gauges. Contamination can destroy valuable test instruments.

NOTE: If the natural color of the fluid has become black or milky, it is possible that an overheating or water contamination problem exists.



Suction Filter Cut Away View **Figure 5-8**

Charge Pressure Diagnostic Test

The first diagnostic test on a hydrostatic transmission is a measurement of the system charge pressure.

NOTE: The nominal valve cracking pressure, as marked on the top of the pump charge pressure relief valve, is 022, or 220 psi (15 bar).

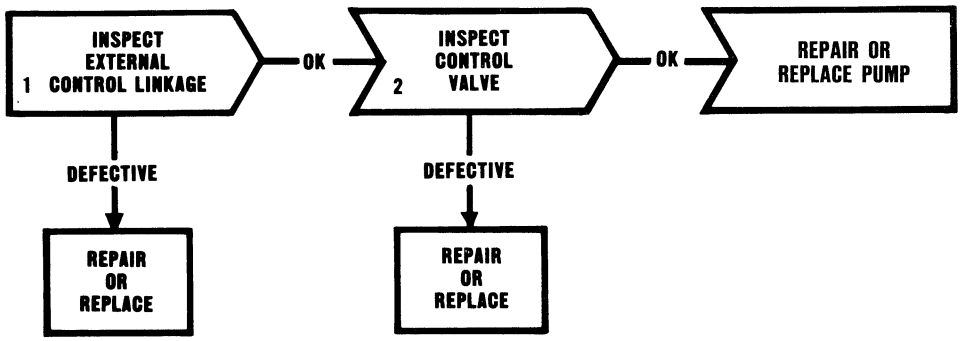
022 = 220 psi (15 bar)

To prevent unnecessary replacement of equipment, Eaton Hydraulics Division has published this series of fault-logic troubleshooting flow charts.

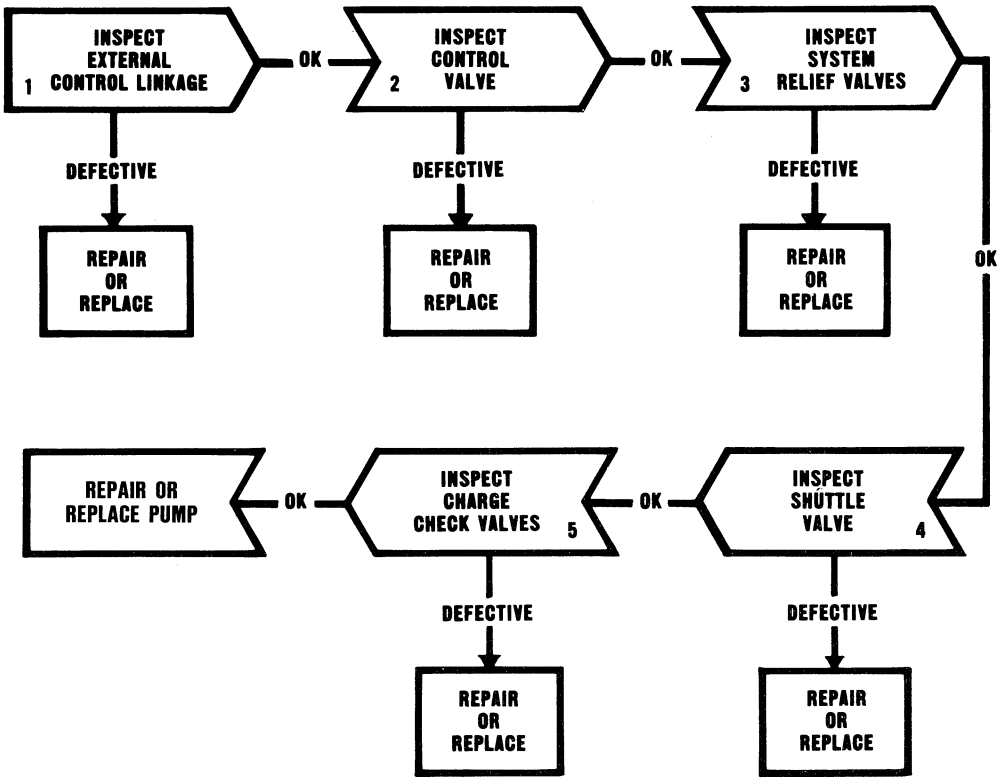
Each flow chart states a common hydrostatic transmission problem of tractor failure and guides the technician through a series of fault-logic steps. These fault-logic steps help determine whether the problem is as simple as a faulty valve or as complicated as a pump or motor replacement.

Match the transmission symptoms with the problem statements and follow the action steps shown in the box diagrams. This will give the user expedient aids in correcting minor problems, eliminating unnecessary machine down time.

Neutral Difficult or Impossible to Find



Transmission Operates in One Direction Only



Important: Cleanliness is extremely important when repairing a hydrostatic pump or motor. Before disconnecting the lines, clean foreign material from exterior of unit. Work in a clean area. Clean all metal parts in clean solvent. Blow parts dry with air. Don't wipe parts with cloth or paper towel, because lint or other matter could cause damage. Check all mating surfaces. Replace any parts that have scratches or burrs that could cause leakage. Don't use coarse grit paper, files, or grinders on parts.

Note: All torque specifications are for lubricated threads. Bolts for gasketed surfaces should be retorqued a second time.

A good service policy to replace all old seals with new seals whenever unit is disassembled. Lubricate seals (except metal sealing surfaces of shaft seal assembly) with petroleum jelly. Use only clean, recommended oil when assembling the unit. See specifications page later in this section for recommended fluids.

See page 5-45 for shaft seal reassembly instructions.

Disassembly Shaft Seal

Important: Clean surface area around stationary seal assembly.

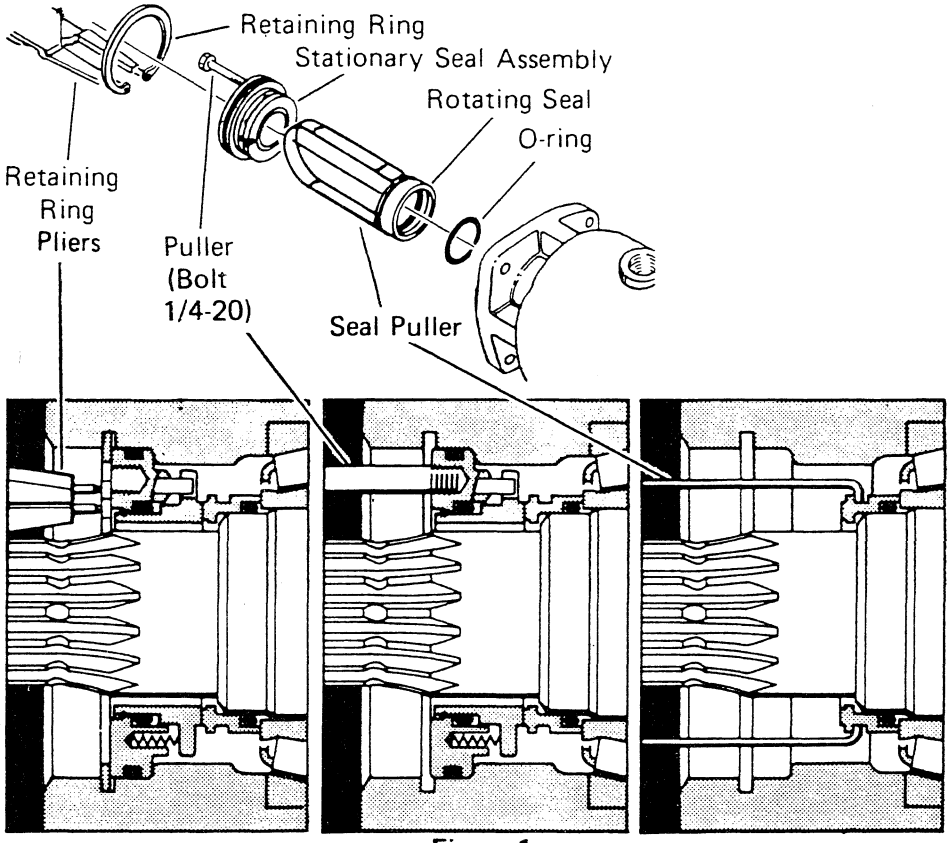


Figure 1

1 Use a pair of retaining ring pliers to remove retaining ring.

2 Insert stationary seal puller into threaded hole of stationary seal assembly to pull seal assembly from mounting flange.

3 Use rotating seal puller, FNH00355, Figure 1, to grip outside diameter of bronze rotating seal. Remove seal from output shaft.

4 O-ring may remain in rotating seal recess. If not found in recess, remove o-ring from main motor shaft.

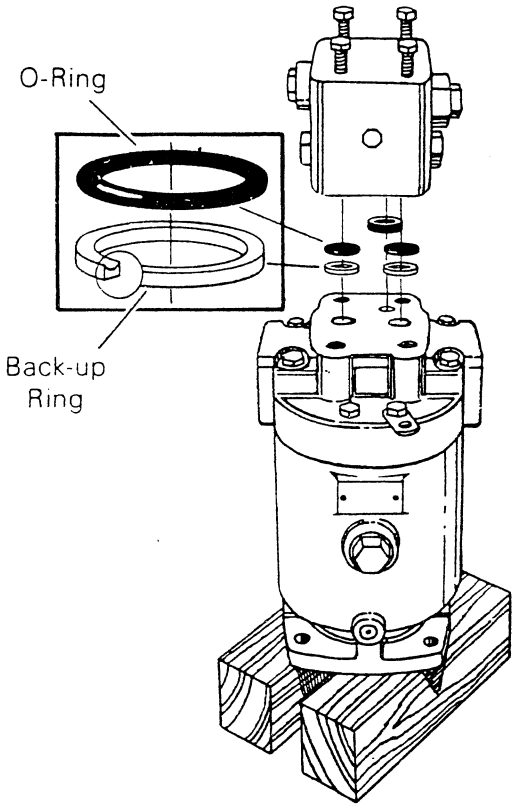


Figure 30

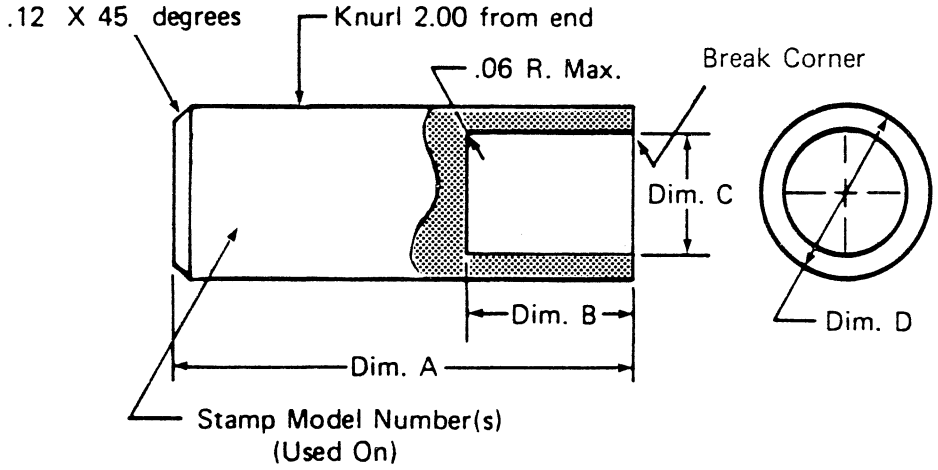
67 Install o-rings and back-up rings on valve bloc The high pressure ports require an o-ring and backup ring. The o-ring goes on first, then the backup ring—with the rounded side of ring toward the o-ring—as shown in Fig 30. Install square-cut ring in low pressure drain port of valve block.

Note: Be careful not to damage o-rings and backup rings. Use clean petroleum jelly to hold o-rings and backup rings in place during block installation.

68 Install valve block on end cover. Then install four hex bolts. Torque bolts 28 lb-ft [38Nm].

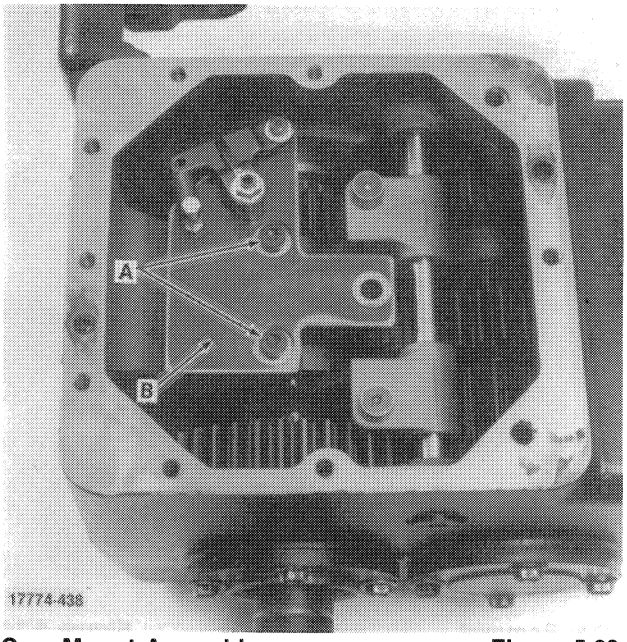
Torque Specifications for Lubricated Threads – lb-ft[Nm]	
Where Used	Model 46
End Cover Bolts—Grade 8	39[53]
Relief Valve (Low Press.)	75[100]
Relief Valve (High Press.)	25[34]
Relief Valve (Feathering)	25[34]
Shuttle Cap	68[92]
Socket Pipe Plug	16[22]
Valve Block Mounting Bolts	28[38]

Shaft Bearing Cone Driver (End Cover end)



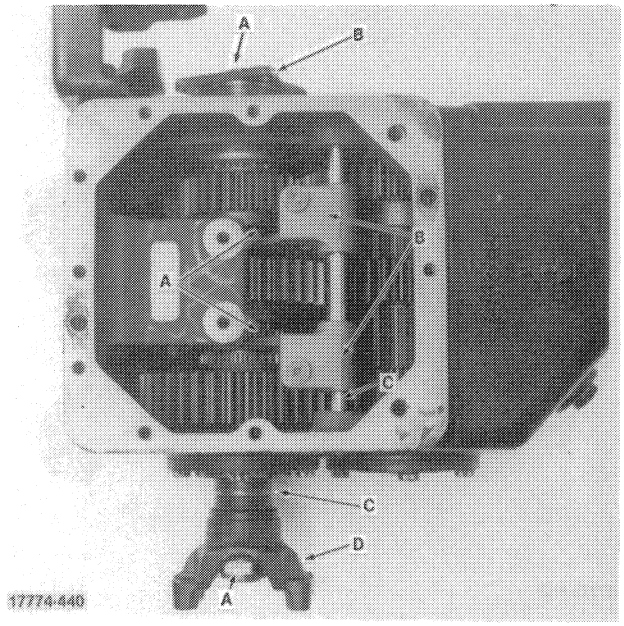
Material: C.R.S., Harden to Rc 50-55

Model	Dim. A.	Dim. B	Dim. C	Dim. D
46	4.0	1.5 *	1.01	1.25



Cam Mount Assembly **Figure 5-29**

A Allen head cap screws
B Cam mount assembly



Flange and Yoke Removal **Figure 5-30**

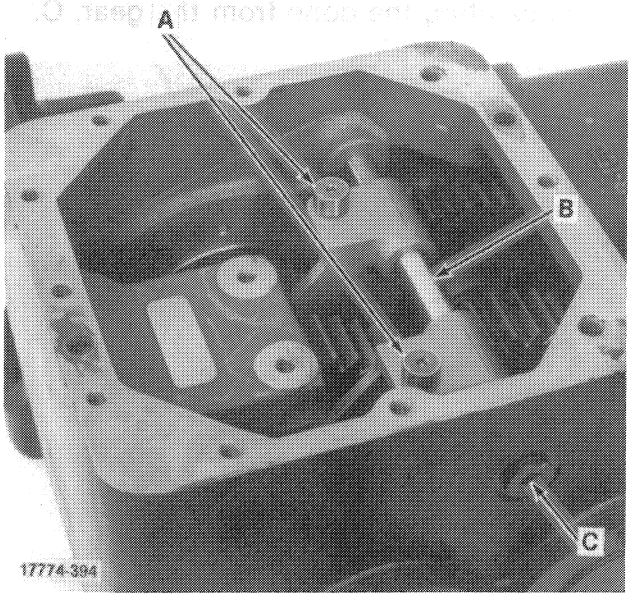
A Locknut and washer
B Universal flange
C Output shaft
D Universal yoke

5. Remove the allen head cap screws, A, Figure 5-29, and remove the cam mount assembly, B.

6. Remove the locknut and washer, A, Figure 5-30, from each end of the output shaft, C.

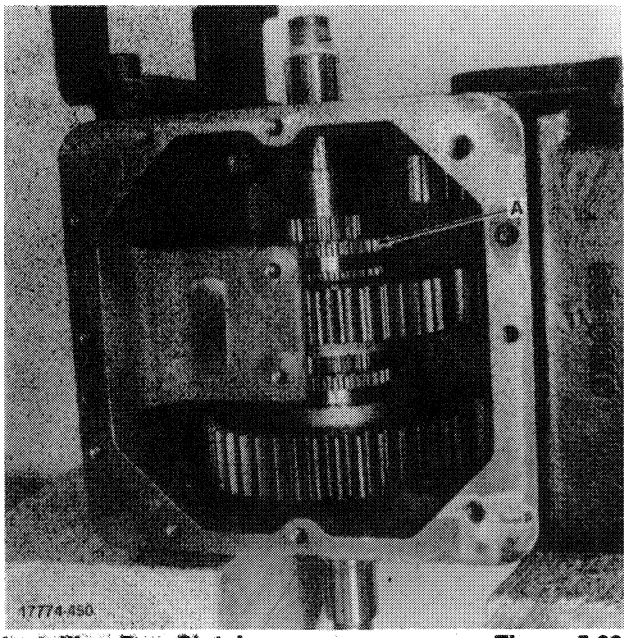
7. Remove the universal flange, B, Figure 5-30, from the engine end of the transmission output shaft and the universal yoke, D, from the cab end of the output shaft. A puller may be required to remove the flange and yoke.

8. Remove the plugs, C, Figure 5-31. Drive out the shift rail, B, and remove the shifter forks, A.

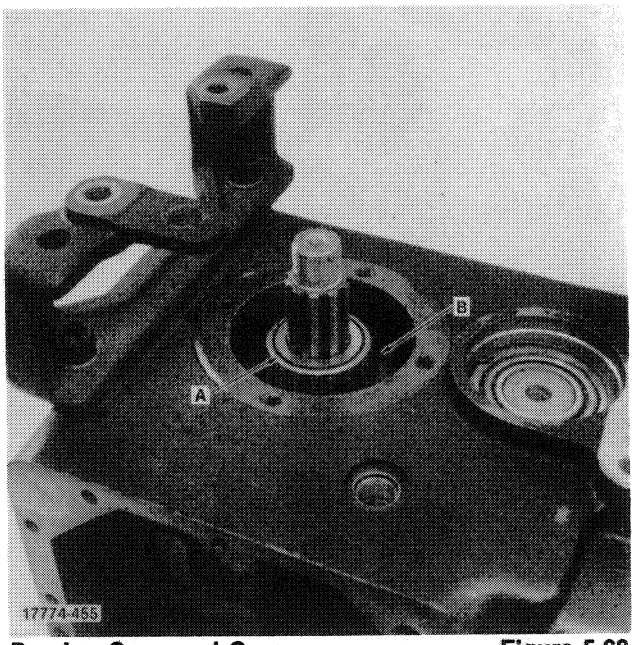


Shifter Fork Removal **Figure 5-31**

A Shifter forks
B Shift rail
C Plug



Installing Dog Clutch **Figure 5-62**
A Dog clutch



Bearing Cone and Gear **Figure 5-63**
A Bearing cone
B 29 tooth gear

11. Install the dog clutch, A, Figure 5-62, on the shaft with the wide teeth up or toward the front of the transmission.

12. Install the 29 tooth gear and bearing assembly onto the output shaft with the hub toward the rear or center of the transmission.

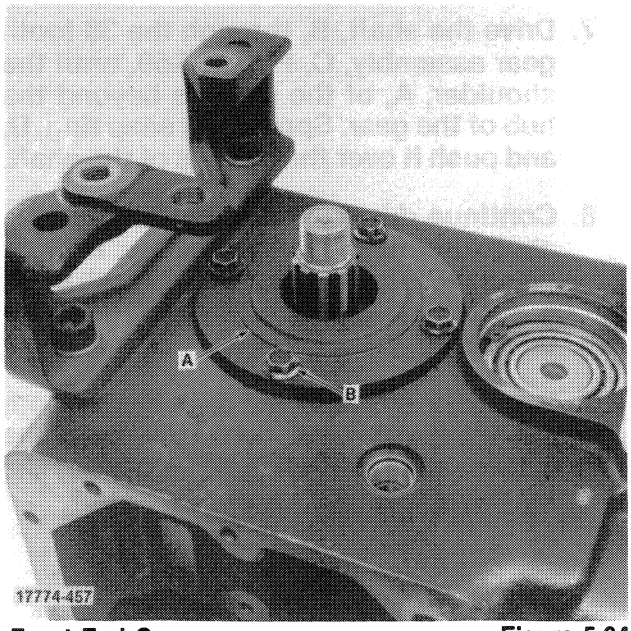
13. Place a spacer in the gear and then install the second ball bearing over the shaft and into the gear. Drive the gear and bearing assembly down the shaft until the inner bearing contacts the shoulder on the shaft.

14. Install a spacer on the shaft and then install the bearing cone, A, Figure 5-63. Fully seat the cone against the spacer and the ball bearing in the 29 tooth gear, B.

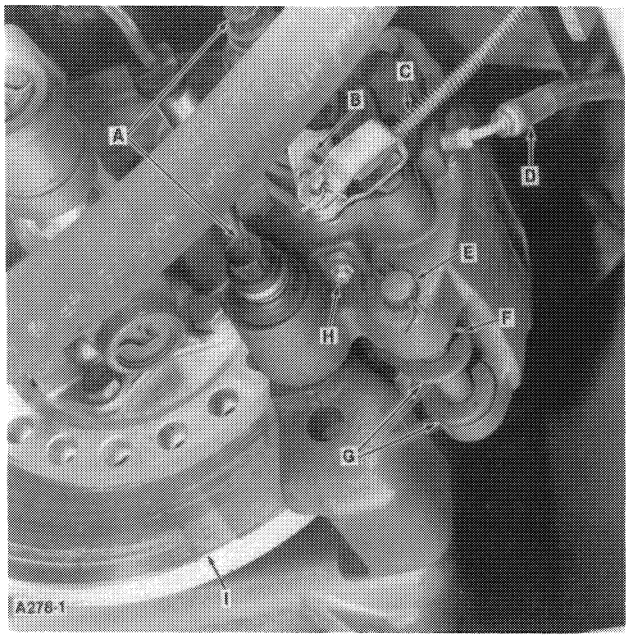
15. Install a bearing cup and new oil seal in the front bearing cap.

16. Install the front bearing cap assembly and gasket, A, Figure 5-64, on the transmission housing. Coat the threads of the cap screws, B, with pipe thread sealant. Torque the cap screws to 30 lbs.-ft. (40 N·m).

17. Turn the transmission over so that the rear faces up. Install a spacer and ball bearing in the 43 tooth gear.



Front End Cap **Figure 5-64**
A End cap assembly
B Cap screw



Brake Caliper **Figure 5-85**

A Mounting bolts
B Park brake lever
C Park brake cable
D Brake fluid line
E Brake pad pins
F Hair pin
G Brake pads
H Bleed screw
I Rotor

Continue this process until there is no sign of air bubbles in the fluid.

5. Close the lower bleed screw and remove the tube.

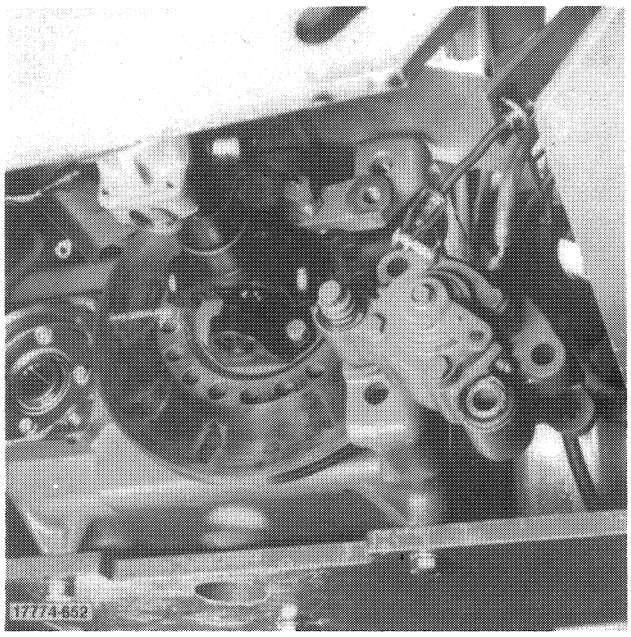
6. Fill the reservoir to 0.125"(3 mm) of the top and replace the cover and diaphragm gasket.

Check the system for leaks and tighten fittings if necessary. Discard the old brake fluid as it contains air and must not be reused.

BRAKE PAD REPLACEMENT

1. Loosen the caliper mounting bolts, A, Figure 5-85, and remove the lower one so that the caliper assembly will pivot outward.

2. Remove the hair pins, F, Figure 5-85, from the brake pad mounting pins, E. Remove the lower pin. Carefully withdraw the upper pin and let the rear and then the front pads, G, drop through the opening in the bottom.

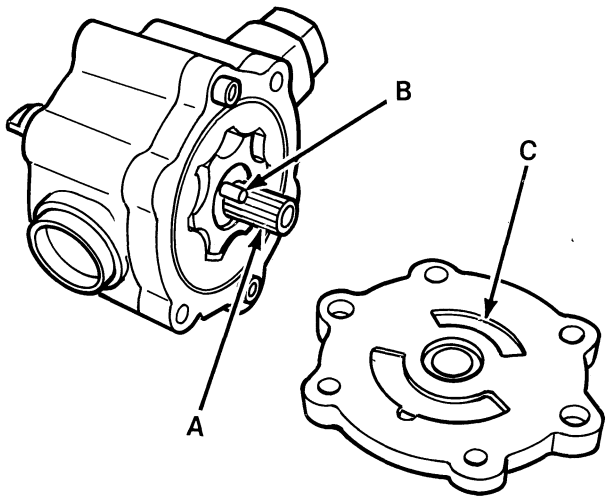


Repositioning Caliper **Figure 5-86**

3. When new brake pads are used the caliper piston must be turned into the caliper as far as possible. Do this as follows:

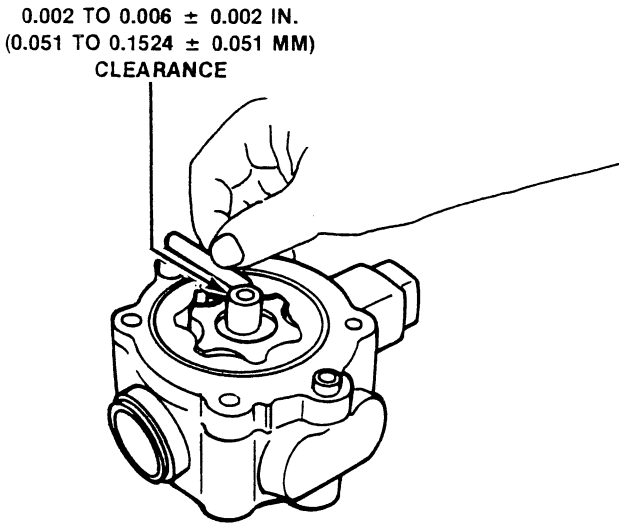
   a. Remove the caliper mounting bolts, A, Figure 5-85. Carefully lower the caliper assembly and align the top mounting hole of the caliper with the bottom mounting hole of the caliper mount as shown in Figure 5-86. Install the bolt temporarily to hold the assembly duriing adjustment.

   b. Remove the cover from the master cylinder reservoir. Repositioning the piston may displace enough brake fluid to cause the reservoir to overflow. Have a helper observe the reservoir and remove fluid as necessary.



Charge Pump Disassembly **Figure 5-98**

A Drive shaft
B Drive pin
C End cap



Gear/Rotor Clearance **Figure 5-99**

Overhaul and Installation

1. Remove the two cap screws securing the charge pump sections together. Do not allow the drive pin, B, Figure 5-98, to fall from the drive shaft slot, A. Do not separate the sections.

2. Put the charge pump in a vise, input shaft down.

3. Turn the input shaft until the two star gear teeth fully engage the ring gear.

4. Measure the gap between the ring gear and the star gear tooth opposite a tooth fully engaged in the ring gear, Figure 5-99. The gap must be 0.002 to 0.006 ± 0.002 in. (0.051 to 0.1524 ± 0.051 mm). Replace the star and ring gear if the specification is not met.

   NOTE: The star and ring gear must be replaced as a set.

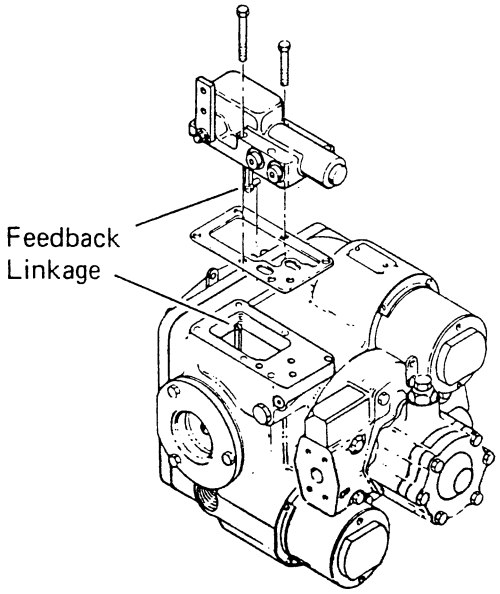


Figure 2

5 Remove cap screws from control valve assembly.

6 Remove control valve assembly from pump housing by lifting assembly upward and over to disengage control feedback linkage. See figure 2.

7 If orifice does not need replacing, proceed to step 9. To remove orifice, position control valve assembly with mounting surface facing upward. Use small screwdriver to remove seal ring and orifice will drop out.

> NOTE: **In most cases it is not necessary to remove the orifice for cleaning. Normal flushing should be all that is required.**

8 Remove control valve gasket from pump housing and discard.

9 Remove only the four outside corner cap screws from charge pump. See figure 3.

10 Remove charge pump assembly, charge pump jasket and dowel pins from pump end cover.

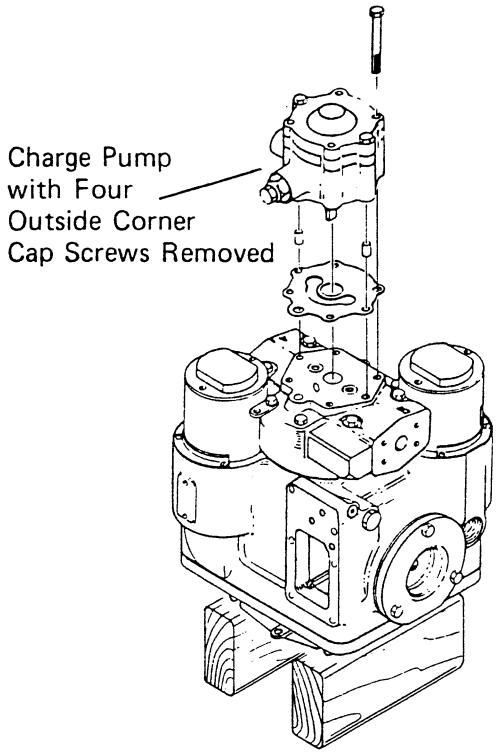


Figure 3

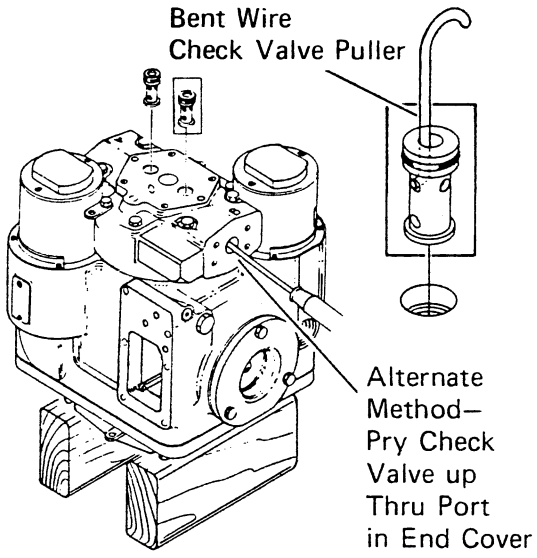


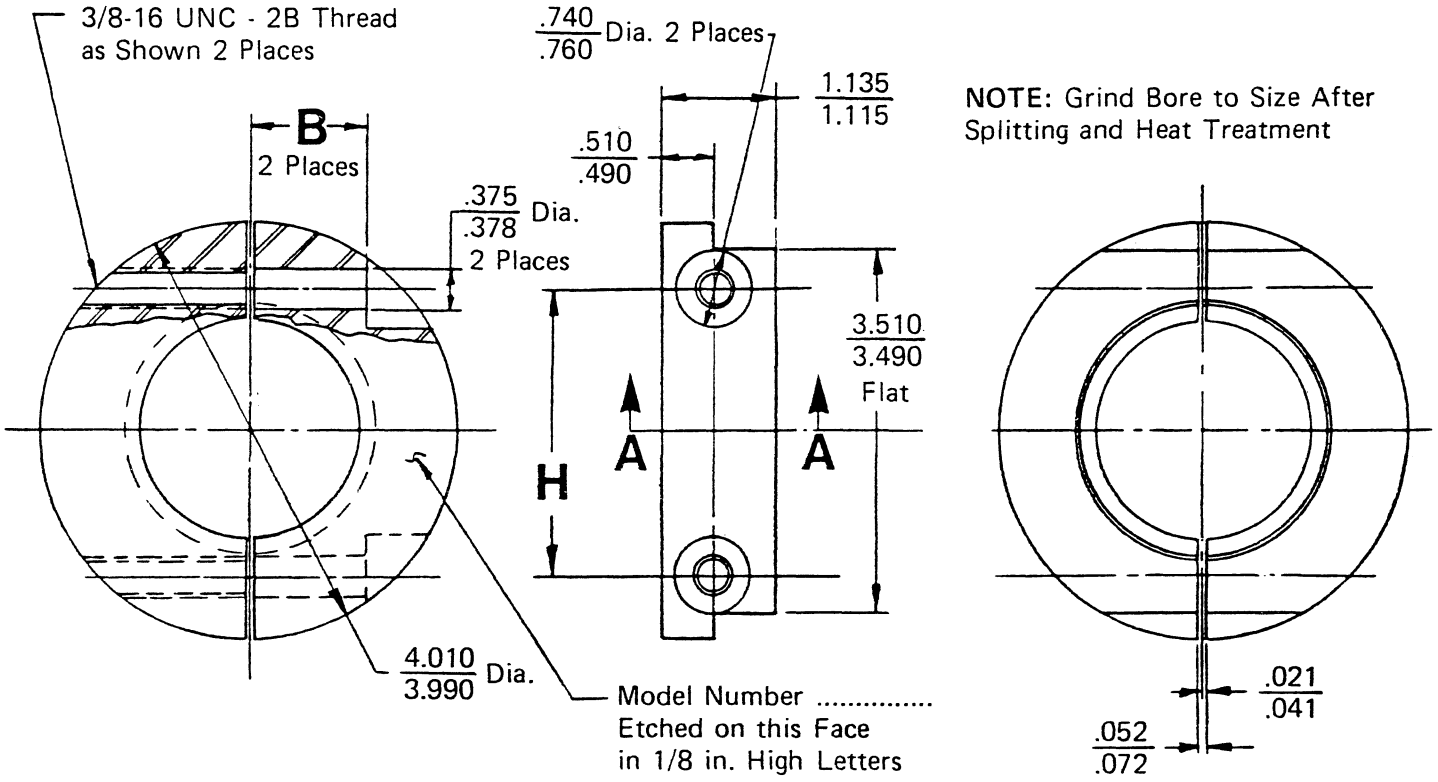
Figure 4

11 Remove the two check valve assemblies by inserting check valve puller (figure 4) into valve crosshole. Pull valve from pump end cover.

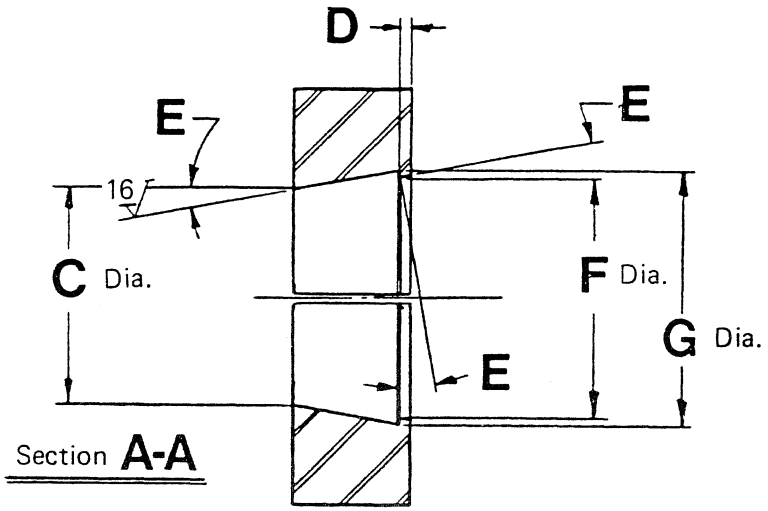
12 Remove o-rings and back-up rings from check valve assemblies and discard.

13 Important: Use extreme care when handling internal parts as they have close tolerances.

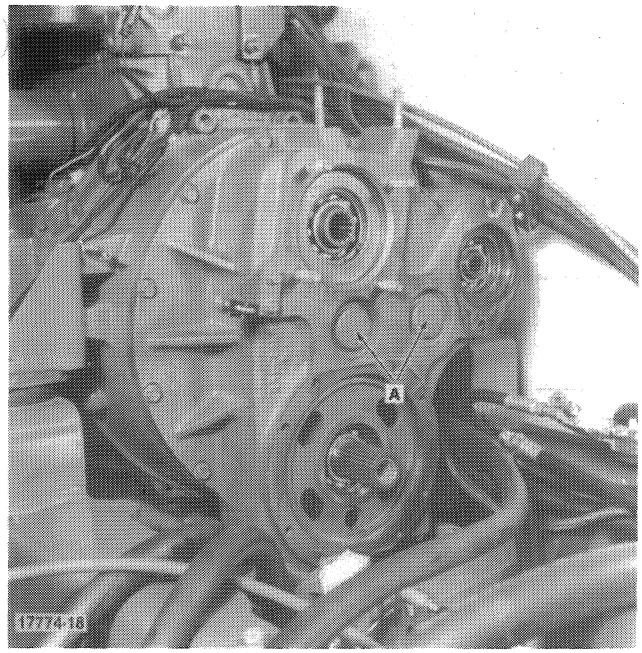
Low Clearance Bearing Puller



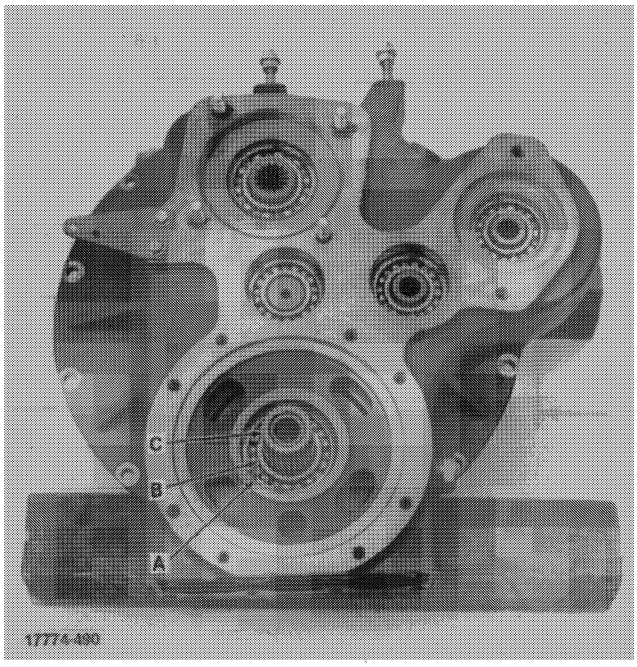
MATERIAL/HEAT TREAT
Stentor / 45 - 55 R_C
TITLE
Cone Bearing Puller



	Displacement cu. in./rev.
	4.6
B	1.050 / 1.070
C	1.565 Ref.
D	1.35 / 1.29
E	12° -45′ / 13° -15′
F	1.907 / 1.913
G	2.020 / 2.026



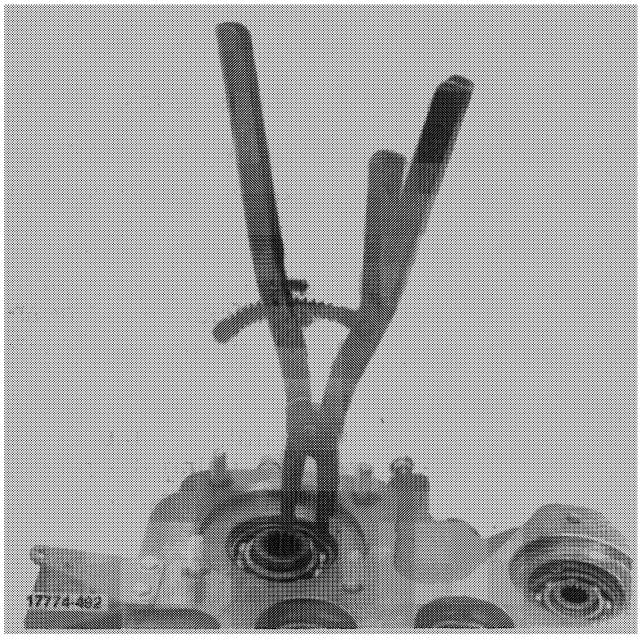
Expansion Plugs **Figure 5-112**
A Plugs



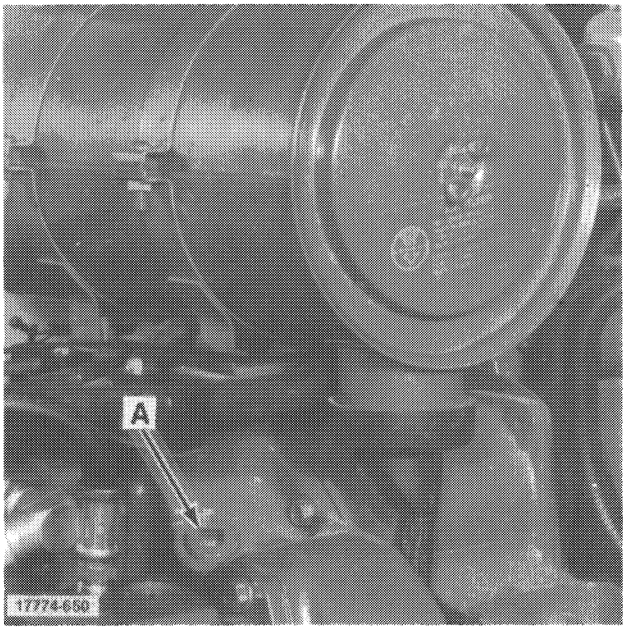
Removing Snap Rings **Figure 5-113**
A Snap ring
B Input shaft
C Hydrostatic pump drive shaft

2. Remove the plugs, A, Figure 5-112, by drilling a hole in each and prying them out.

3. Remove the snap rings from the PTO drive, A, Figure 5-113, input shaft, B, and hydrostatic pump drive, C. Giant ratchet type snap ring pliers, as shown in Figure 5-114, are required for the PTO drive and hydrostatic pump drive.



Giant Snap Ring Pliers **Figure 5-114**



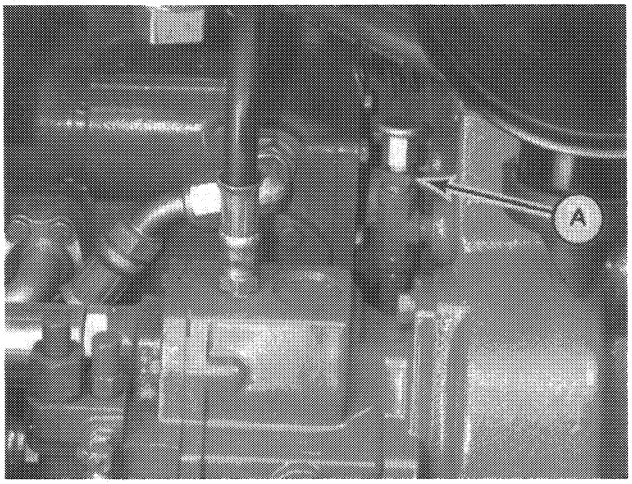
Splitter Box Sight Gauge With Mechanical PTO **Figure 5-140**
A Sight gauge

4. Fill the splitter box with New Holland 134D oil part number US - 9624450 (2X2.5 gal) or CAN - 9613367 (4X4 L) to the level of the sight gauge. The filler plug for mechanical PTO equipped units is shown at A, Figure 5-139, and the sight gauge at A, Figure 5-140.

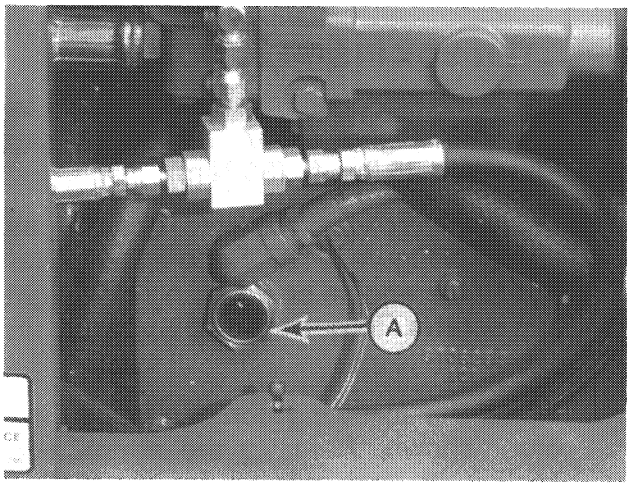
   For electro/hydraulic PTO equipped units, fill through the breather tube, A, Figure 5-141, until proper level is achieved at sight glass, A, Figure 5-142. An alternate fill method is to fill through the elbow above the sight glass, prior to breather hose installation..

   NOTE: New Holland also offers a "cold weather" alternative transmission/hydraulic oil called "F200." This oil has all the qualities of New Holland "134D" hydraulic/transmission fluid, plus the added benefit of improved viscosity at low temperatures. It is sold under part number US - 8655523626DS (5 gal.) or CAN - 86509446 (20L). See your New Holland dealer for details.

5. After all components are installed and filled with the specific oil check all fittings for leaks and top up as necessary.



Splitter Box Breather Tube With Electro/Hydraulic PTO **Figure 5-141**
A Breather tube



Splitter Box Sight Glass With Electro/Hydraulic PTO **Figure 5-142**
A Sight glass

HYDRAULICALLY ACTUATED PTO ELECTRICAL SYSTEM (S/N D200234 AND ABOVE)

On tractors with a hydraulically actuated PTO the clutch is engaged with the PTO switch on the right hand console, Figure 6-3.

Starting at terminal 1 of the junction box terminal block, 1, Figure 6-6, current is supplied via a blue wire to the fuse, 2.

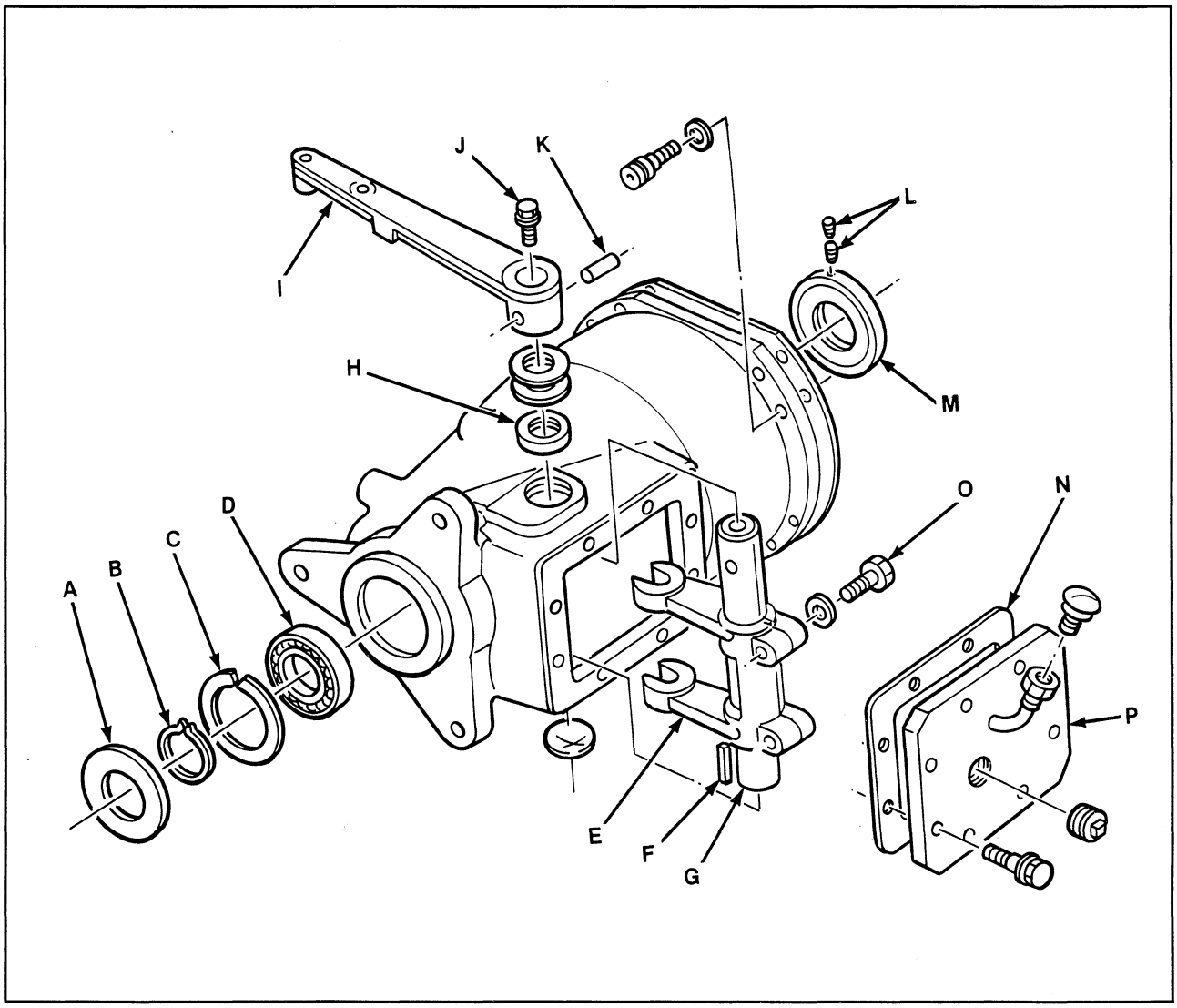
With reference to Figure 6-7, power crosses the 5 amp PTO solenoid fuse and is carried to the right hand side console junction box connector via a red wire that is connected at pin 1. Power then flows to pin 13 on the right hand side console connector. Current flows from the connector to the PTO switch on the right hand console at terminal 2.

When the switch is engaged, connection is made between terminals 2 and 3 on the PTO switch. Current can then flow from terminal 3 via the orange/gray wire, to pin 12 on the right hand side console connector. Power is carried first to the right hand console junction box connector at pin 15, then to the engine junction box connect at pin 12.

Power is then transmitted to the PTO solenoid connector on the right hand side of the PTO housing, Figure 6-8, via the orange/gray wire. Power flows through the connector to energize the solenoid and engage the clutch. A black wire runs from the solenoid to the frame to act as a ground for the electrical circuit.

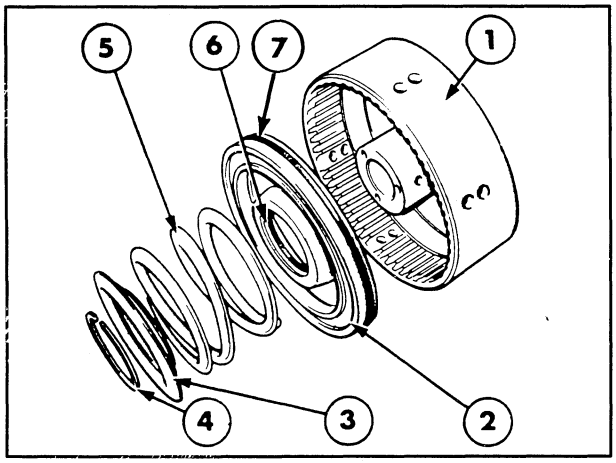
DISASSEMBLY

1. Remove the case cover plate, P, Figure 6A-6.
2. Remove the roll pin, K, Figure 6A-6, from the clutch lever.
3. Remove the universal end yoke, A, Figure 6A-2, from the output end of the clutch shaft. If the tractor is equipped with an engine end PTO, the clutch output shaft fits directly into the PTO transfer gearbox.
4. Remove oil seal, A, Figure 6A-6, and snap ring, B. Press, or drive out the shaft and clutch assembly.
5. If the bearing, D, Figure 6A-6, needs to be replaced, remove the internal snap ring, C, and drive the bearing out of the clutch case.



PTO Clutch Assembly **Figure 6A-6**

A	Seal	E	Yoke	I	Lever	M	Drag brake disc
B	Snap ring-external	F	Square Key	J	Cap screw	N	Gasket
C	Snap ring-internal	G	Shaft	K	Roll pin	O	Cap screw
D	Bearing	H	Seal	L	Set screws	P	Cover plate



Clutch and Valve Assembly **Figure 6A-24**

1 Clutch housing
2 Piston
3 Spring keeper
4 Snap ring
5 Return spring
6 Piston inner seal
7 Piston outer seal

3. Using spring compressor FNH 01312 and a suitable press, remove the return spring by detaching the retaining ring and seat, then the clutch piston can be removed from the clutch drum, Figure 6A-24.

   Replace the inner and outer sealing rings on the clutch piston.

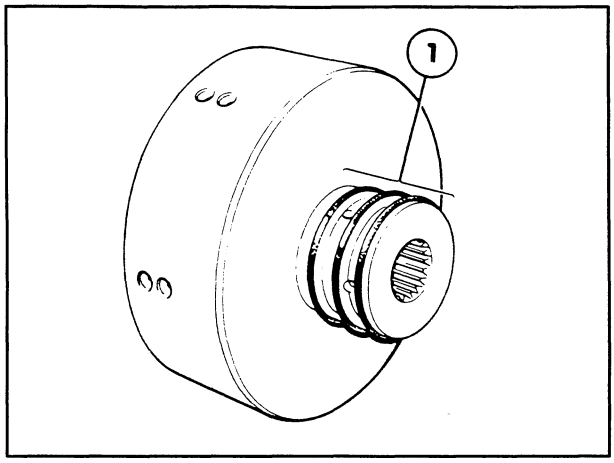
CAUTION: THE CLUTCH PISTON IS UNDER EXTREME COMPRESSION. DO NOT ATTEMPT TO REMOVE THE SPRING WITHOUT THE PROPER TOOLS.

NOTE: The piston can be removed by applying low air pressure (10 psi) to the supply passage an the clutch drum.

4. Examine the cast iron sealing rings on the clutch housing, Figure 6A-25. Replace if worn or damaged.

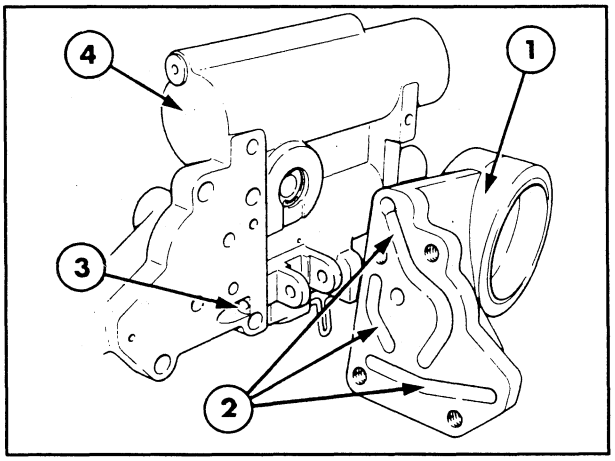
5. Separate the clutch support, 1, from the valve body, 4, Figure 6A-26, by removing the four allen head screws.

   NOTE: There is no gasket between the clutch support and the valve body.



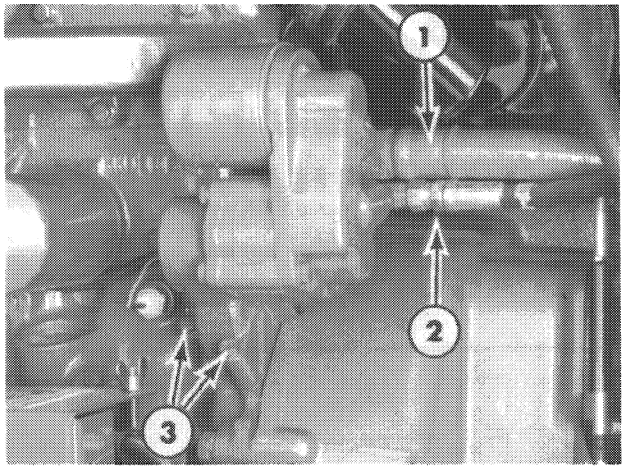
Clutch Assembly Sealing Rings **Figure 6A-25**

1 Cast iron sealing rings (3)



Clutch Support and Valve Housing **Figure 6A-26**

1 Clutch support
2 Oil supply galleries
3 Filter location
4 Valve body



Hydraulic Pump **Figure 6B-2**

1 Suction line
2 Pressure line
3 Retaining bolts

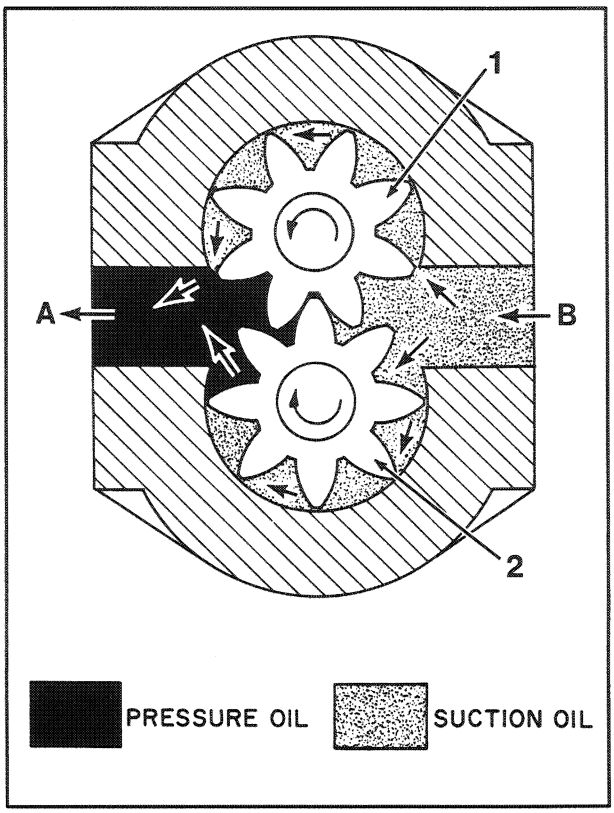
OIL FLOW

When hydraulic oil enters the pump, refer to Figure 6B-3, it fills the spaces between the teeth of the revolving gears and is then carried around, within the pump body, to the point where the teeth of the two gears come into mesh. The oil cannot pass back though the gears and is forced out of the pump body to the outlet port of the pump cover.

Oil flows out of the port into a pressure line, 2, Figure 6B-2. The oil flows via the pressure line to the oil cooler, 1, Figure 6B-4. From the oil cooler the oil enters the pressure line that carries the oil to the inlet port of the PTO clutch housing.

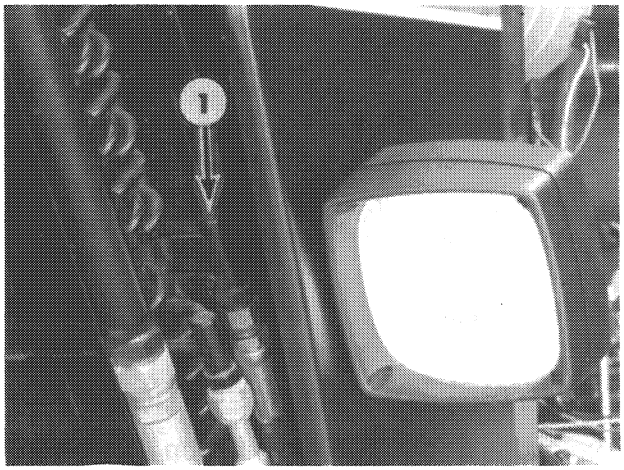
REMOVAL

1. Thoroughly clean the pump at the cover area before removal.
2. Unscrew and disconnect the suction and pressure lines.
3. Remove the four retaining bolts, 3, Figure 6B-2, lift the pump off the tractor and pull free from the pressure and suction lines. Cap the pressure and suction lines.



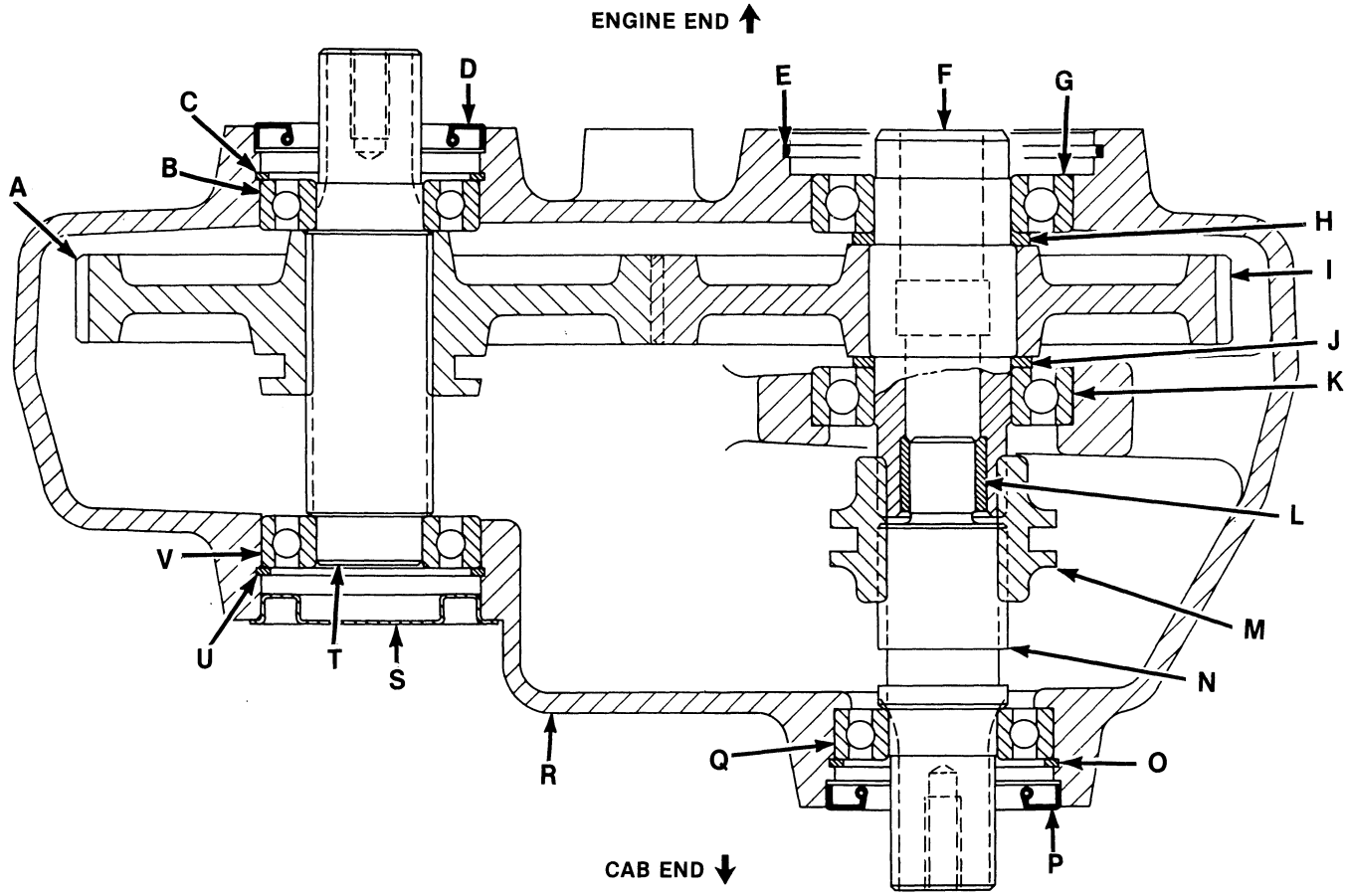
Oil Flow in Hydraulic Gear Type Pump **Figure 6B-3**

1 Driven gear
2 Drive gear
A To Hydraulic Circuit
B From reservoir



Oil Cooler **Figure 6B-4**

1 Oil cooler



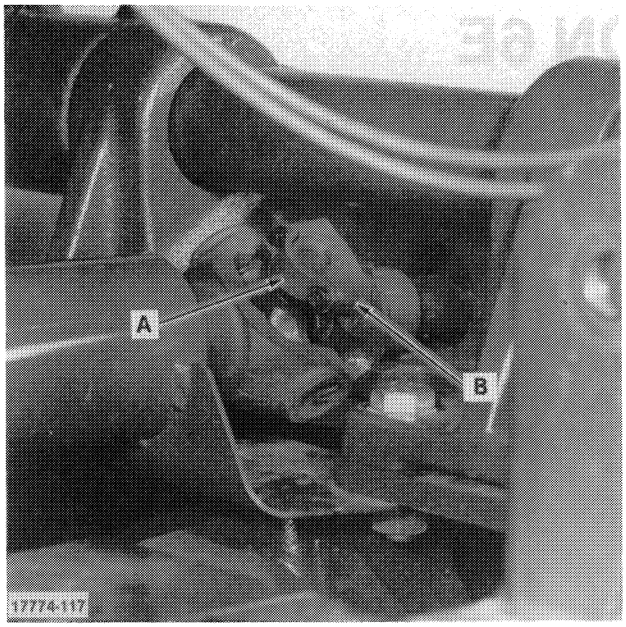
Transfer Gearbox Cross Section **Figure 6C-9**

A	Gear 60 teeth	F	Shaft	J	Inner spacer	O	Snap ring	T	Shaft
B	Bearing	G	Outer bearing	K	Inner bearing	P	Oil seal	U	Snap ring
C	Snap ring	H	Outer spacer	L	Bushing	Q	Bearing	V	Bearing
D	Oil seal	I	Gear (59 teeth)	M	Shift collar	R	Housing		
E	O-ring	J	Inner spacer	N	Shaft	S	Bearing cover		

DISASSEMBLY (SHIFTER FORKS REMOVED)

1. Drain the oil and wash the gearbox assembly with an approved solvent.
2. Remove the cap screws holding the universal yokes to both output shafts, and remove the yokes.
3. Remove the two oil seals, D and P, Figure 6C-9.
4. Remove the bearing cover, S.
5. Remove the three snap rings, C, O and U.
6. Drive, or press out shaft, T, from the engine end, and remove gear, A.
7. Drive, or press out shafts, F and N, from the cab end, Figure 6C-9. Shaft, N, will be pushed out of the bearing, Q, and the inner bearing, K, will be pushed out of its support as shaft, F, outer bearing, G, and outer spacer, H, are pushed out of the gearbox.
8. Remove gear, I, and inner spacer, J, Figure 6C-9. Push shaft, N, towards the cab end, and remove shift collar, M. It may be necessary to drive shaft, N, back into bearing, Q, to remove shift collar, M. Remove the remaining bearings, K and Q, from the transfer gearbox, Figure 6C-9.
9. Remove any bearings remaining on the shafts.
10. Inspect all parts and replace any that are worn, or damaged.

NOTE: If bushing, L, is replaced, make sure shaft, N, Figure 6C-9, will turn FREELY in the bushing before installing shaft, F, in the gearbox.

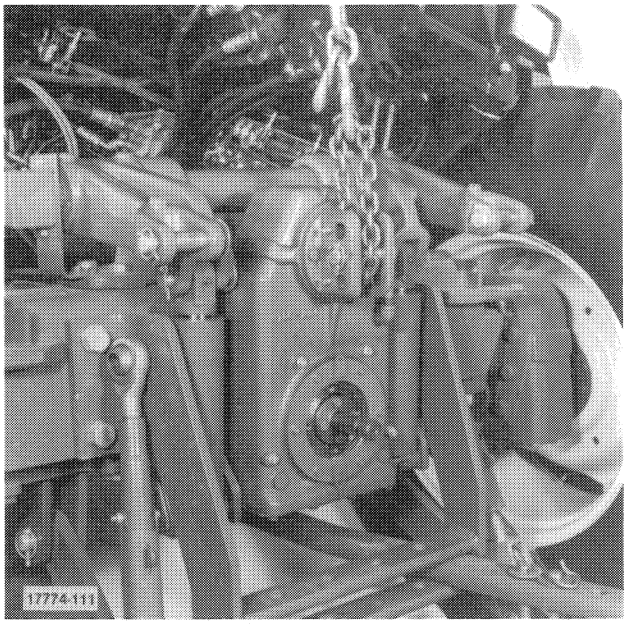


Cab End Drop Box Universal **Figure 6E-3**

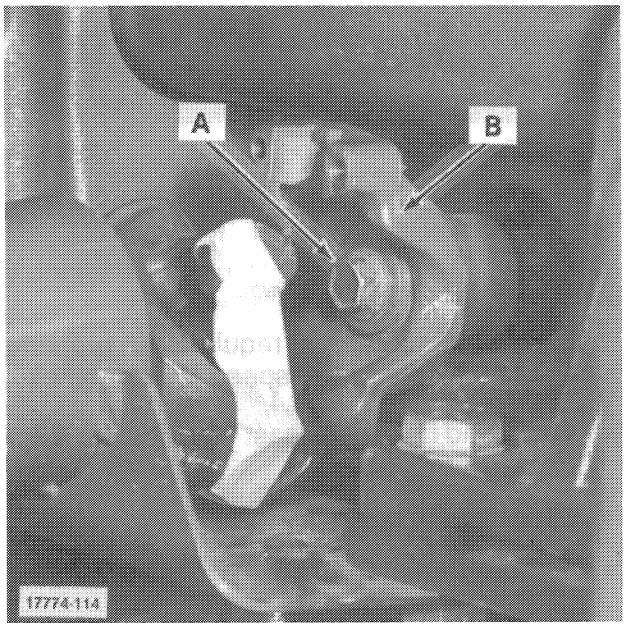
A Journal strap
B End yoke

4. Remove the journal straps, A, Figure 6E-3, on the universal end yoke. Separate the tube yoke from the end yoke. Tape the journal bearings in place to prevent them from dropping out of position.
5. Support the drop box with a hoist, Figure 6E-4.
6. Remove the three self-locking nuts and flat washers securing the drop box to the frame.
7. Move the drop box to the rear, far enough to gain access to the cap screw and washer, A, Figure 6E-5, holding the end yoke, B, to the drop box input shaft. Remove the bolt and slide the yoke off the shaft.
8. Move the drop box to the rear until it clears the tractor frame.

CAUTION: THE DROP BOX WILL TEND TO TIP FORWARD WHEN IT CLEARS THE FRAME. TO MAKE REMOVAL EASIER, SLIDE A LONG PIPE OVER THE OUTPUT SHAFT, AND USE THE PIPE TO BALANCE THE DROP BOX AS IT IS REMOVED.

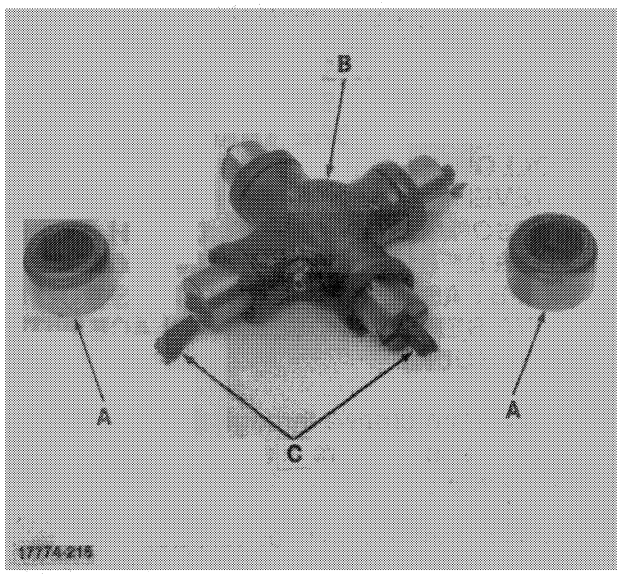


Supporting Drop Box **Figure 6E-4**



End Yoke Cap Screw **Figure 6E-5**

A Cap screw and washer
B End yoke



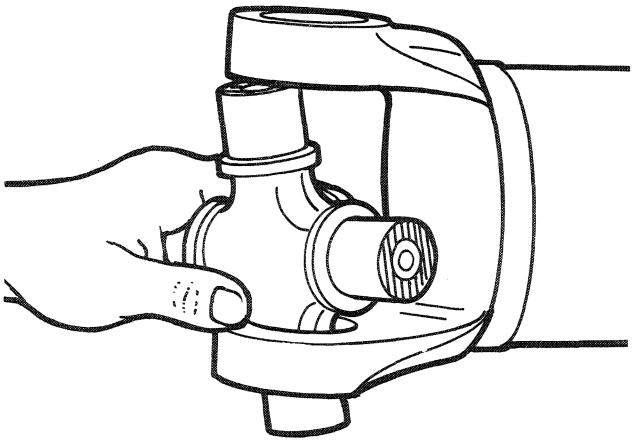
Pre-lubing Cross **Figure 6F-9**

A Bearing assembly
B Cross
C. FNH part #9861804 grease

ASSEMBLY

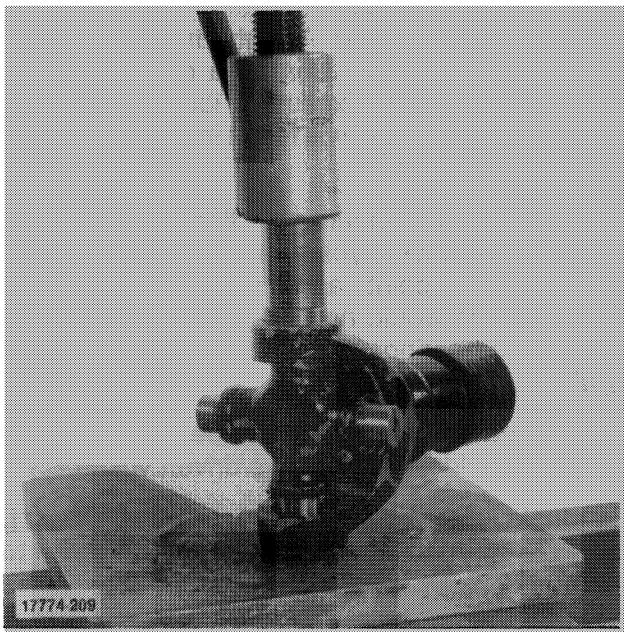
Two types of universal joint cross kits are used on the 9030 tractor. The universals on the cab end and engine end PTO drop box drive shafts are a lube for life design, and have no lube fittings. Lifetime lubrication is done by Spicer at the time of manufacture, and re-lubrication is not necessary. All other universal joints used on both the transmission and PTO drivelines, require lubrication in service, and must be pre-lubed as follows, before being installed:

1. Pack the four grease cavities of the cross with extreme pressure grease, such as part #9861804. Also, pack each bearing assembly approximately one-quarter full with this grease, Figure 6F-9.
2. Position the cross in the yoke with its lube fitting on the inboard side (toward drive shaft), Figure 6F-10.

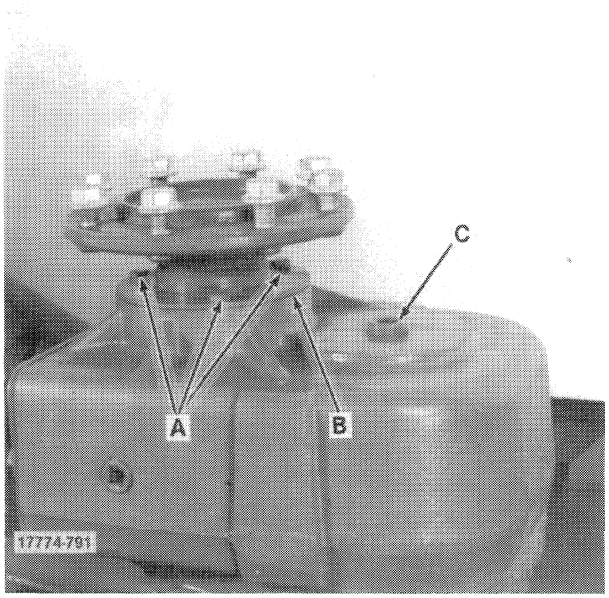


Positioning Cross **Figure 6F-10**

3. Move one end of the cross to cause a trunnion to project through the cross hole beyond the outer machined face of the yoke lub. Place a bearing assembly over the trunnion diameter and align it to the cross hole. Using an arbor press, hold the trunnion in alignment with the cross hole and place a solid plug on the upper bearing assembly. Press the bearing assembly into the cross hole enough to install a snap ring, Figure 6F-11.
4. Install a snap ring.

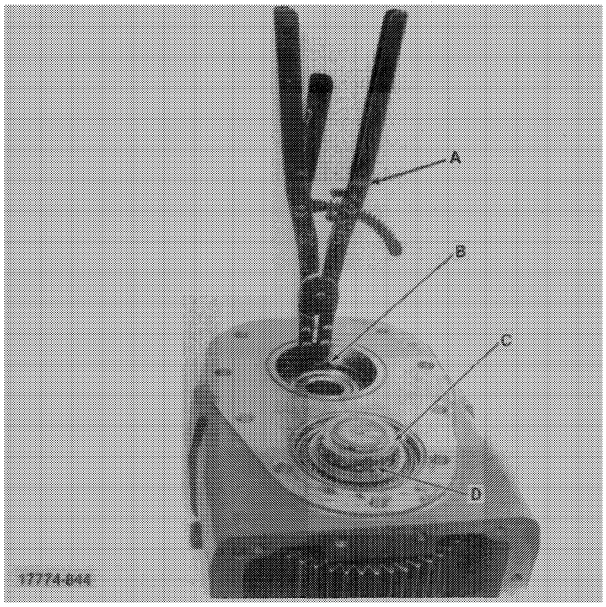


Installing Bearing in Yoke **Figure 6F-11**



Disassembling the Drop Box **Figure 7-7**

A Cap screws (3)
B Bearing shield
C Axle shaft access plug



Disassembling the Drop Box (s/n D470100 - D932002 shown) **Figure 7-8**

A Giant snap ring pliers
B Snap ring
C Spanner nut
D Locking tab washer

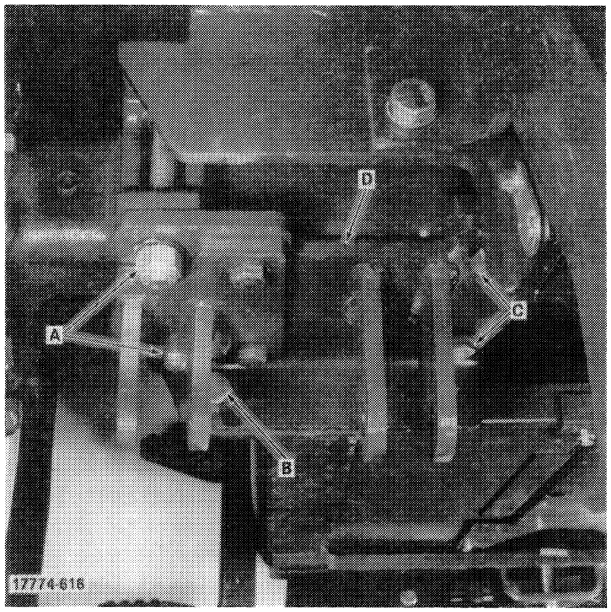
Disassembly

Removing the Stub Axle Shaft

NOTE: 9030 tractors starting with s/n D932002 use a stub axle shaft that incorporates a serrated axle nut and cotter pin to retain the stub axle in the drop box assembly. All disassembly and reassembly procedures are identical to overhaul the drop box for all serial number units. Figure 7-10A shows a cross section of the serrated nut and cotter pin style drop box. See the 1994 New Holland service bulletins for more information on the new style axle and drop box assembly.

1. Lay the drop box on its side. Remove the cap screws, B, Figure 7-4, and remove the cover.

2. Remove the three cap screws, A, Figure 7-7, securing the shield, B, to the housing.



Cab End Axle Mounting to Frame **Figure 7-25**

A Outer mounting bolts, nuts, and hardened washers
B Bracket attaching bolt
C Inner mounting bolts
D Axle mounting plate

9. Remove the nuts and hardened washers from the outer bolts at, A, Figure 7-25, and the bolt, nut, and washer, B, from each side of the axle.

10. Using the hoist, lower the axle assembly from under the frame and onto a floor jack.

    IMPORTANT: Use care not to damage the lift cylinder hydraulic hoses, C, Figure 7-22, while lowering the axle. Disconnect the hoses if necessary.

11. Move the axle assembly to a suitable work area.

CAB END AXLE — INSTALLATION

1. Support the axle assembly under the differential with a floor jack.

2. Move it under the frame and lift it into position with a suitable hoist equipped with a spreader bar.

3. Position the axle mounting plates, D, Figure 7-25, under the axle pads. Secure the axle with the five bolts and special hardened washers under the head and nut of each axle pad bolt, A and C, and under the nut of the pad to frame bolt, B. Torque all to 575-590 lbs.-ft. (780-800 N·m).

   NOTE: The outside bolts must be installed with the heads up. The inside bolts must be installed with the heads down and tightened from the bottom.

4. Connect the drive shaft to the yoke on the differential as shown in Figure 7-22.

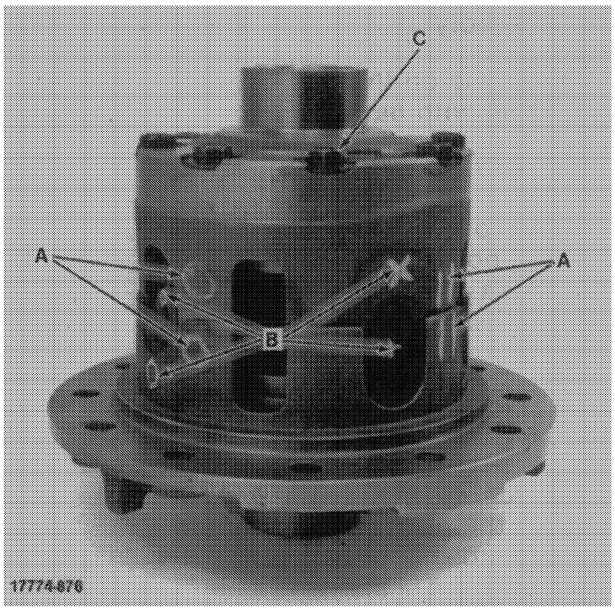
   IMPORTANT: Seat the cross in the yoke with a soft hammer. Do not use bearing cap bolts to draw the cross into position.

   Torque the bearing strap cap screws to 25-30 lbs.-ft. (30-40 N·m). Install the driveline shield, Figure 7-21.

5. Install the three point lift linkage and swinging drawbar.

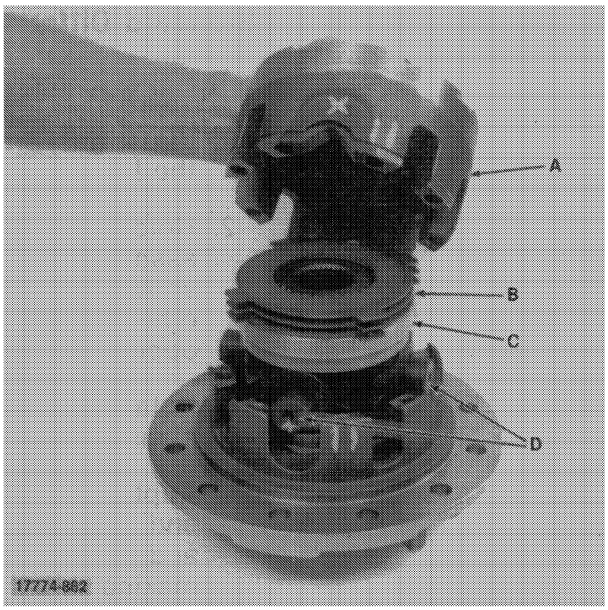
6. Install the wheels and torque the lug nuts to 310 ± 5 lbs.-ft. (420 ± 7 N·m) for 5/8" studs or 525 lbs.-ft. ± 5 lbs.-ft. (711 ± 7 N·m)for 3/4" studs.

   IMPORTANT: Recheck all torque settings after one hour and again after eight hours operation.



Limited Slip Differential Marked for Disassembly **Figure 7-47**

A Housing half marks
B Mate cross shaft marks
C Housing cap screws (8)



Disassembling the Housing **Figure 7-48**

A Housing half
B Clutch pack
C Clutch ring
D Pinion mate cross shafts and gears

PowrLok™ Limited Slip Differential — Disassembly

NOTE: The differential bearings need not be removed to overhaul the limited-slip differential. If the differential bearings require removal, use the same procedure as shown in Step 1, "standard differential."

1. Mark the ring gear and cover halves, A, Figure 7-47, of the differential housing so they can be reassembled in the same relative positions. Mark the pinion mate cross shafts, B, and their corresponding ramps so they also can be assembled in their original positions.

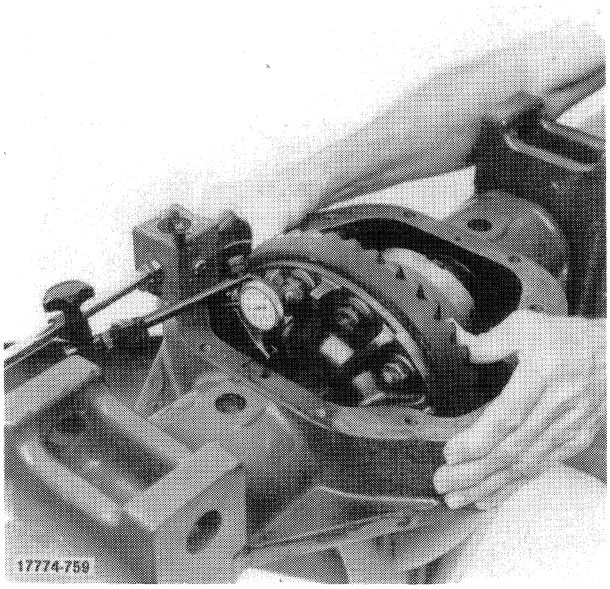
2. Clamp the differential housing in a soft jawed vise and loosen, but do not remove the eight cap screws, C, Figure 7-47, that hold the housing halves together.

3. Place the differential assembly on a bench with the ring gear half of the housing down, Figure 7-48. Remove the attaching bolts and the housing half, A.

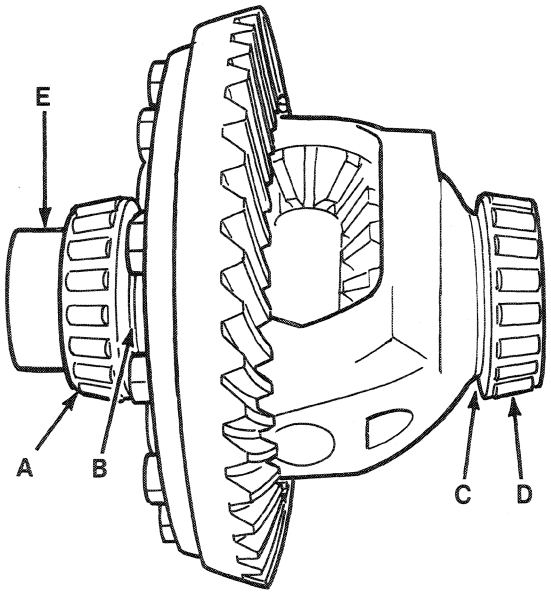
4. Remove the clutch pack, B, clutch ring, C, and the side gear inside the clutch ring. Keep these parts with the housing half so they can be installed in their original positions.

5. Remove the pinion mate shafts and gears, D.

6. Remove the corresponding parts from the ring gear half of the housing. A parts layout is shown in Figure 7-49.



Setting Ring Gear Preload **Figure 7-67**



Differential Shim Pack Location **Figure 7-68**

A Bearing cone
B Shims
C Shims
D Bearing cone
E Installation tool

3. Force the ring gear away from the pinion gear, Figure 7-67, to obtain an indicator reading. Repeat until the same value is obtained each time and record the reading. This reading will be the amount of shims required between the differential housing and the bearing on the ring gear flange end of the differential.

4. Remove the dial indicator. Remove the differential from the axle housing and remove the master bearings, FNH 10932-2.

5. Place the required amount of shims, B, Figure 7-68, as determined in Step 3, on the hub of the ring gear flange side of the differential housing. For example: The reading in Step 3 was 0.045 in. (1.14 mm). Place that amount of shims on the hub.

6. Install the differential bearing cone, A, Figure 7-68, on the hub pressing it into position using tool FNH 10937, E.

7. Determine the correct amount of shims to be placed on the hub at C, by subtracting the reading in Step 3 from the total housing end play determined in Steps 3, 4, and 5 under "Differential Housing Assembly — Installation" in this section.

Example:

• Total housing end play	= "A"	0.091
• Reading from Step 3 above	= "B"	0.045
• "A" - "B"	= "C"	0.046
• Preload of 0.015	= "D"	+0.015
• "C" + "D"	= "E"	0.061

NOTE: Dimension "E", from the example, is the thickness of shims to be added at, C, Figure 7-68. The pre-load value of 0.015 inches "D", in the example, is a constant.

8. Place the required amount of shims as calculated in Step 7 on the drive pinion side of the case assembly at C, Figure 7-68, and install the bearing cone, D. Be sure to use a support, under the bearing on the ring gear side so that the bearing will not be damaged while pressing the opposite bearing into position.

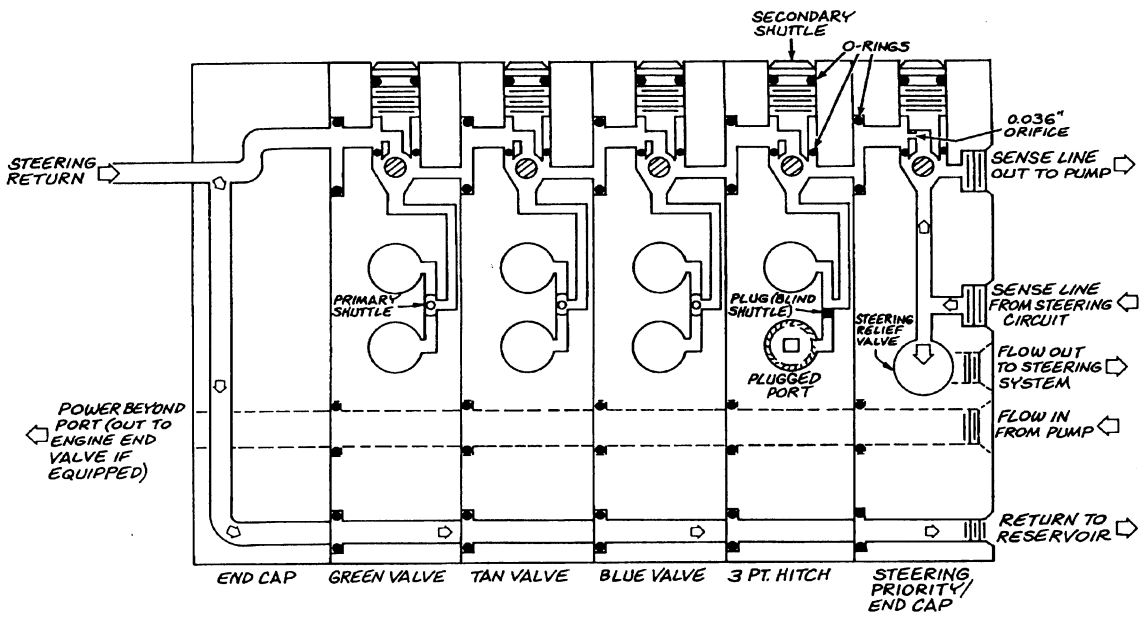
The cab end implement valve, which comes standard on the 9030 tractor, is iso-mounted to the underside of the cab floor. The spools on the implement valve sections are operated mechanically by levers and pedals in the cab. The levers and couplers are color coded to identify each circuit. The standard valve consists of three sections; blue, tan and green. These sections are bolted together with the priority inlet, three point hitch valve section and the end cap. They share a common supply line, sense line and return line. Each of the implement valve sections is connected to the respective couplers of the same color by supply lines.

If the tractor is equipped with engine end hydraulics, high pressure oil leaves the end cap through the check valve and travels up the left hand side of the engine to the engine end implement valve via a high pressure line. If there is no engine end implement valve, oil is dead headed at the cab end implement end cap. The engine end implement valve is optional equipment on the 9030. It consists of two implement sections and a three point hitch section if the tractor is equipped with a three point hitch. The engine end implement valve is mounted to the frame under the front of the engine.

The spools of the engine end implement valve are operated by levers located in the back right rear corner of the cab. The implement sections and three point section are bolted together with the end cap and inlet body. The sections share a common supply line, signal line and return line. Oil that is returning to reservoir from the three point hitch cylinders or from an external cylinder does so through the valve to a return line attached to the inlet end cap.

Only case drain oil from the hydrostatic system goes through the oil cooler. The oil cooler is located in front of the radiator on the nose of the tractor. Oil returning from the cooler joins the implement pump suction line to control operating oil temperature and help maintain a positive charge to the implement pump.

Figure 8-2 is a schematic of the 9030 hydraulic system.



PRIMARY AND SECONDARY SHUTTLE FLOW SCHEMATIC
IMPLEMENT VALVE - CAB END-9030 BIDIRECTIONAL TRACTOR

Figure 8-9

PRIMARY AND SECONDARY SHUTTLE FLOW

The cab end implement valve primary and secondary shuttle flow schematic is shown in Figure 8-9. The engine end implement valve primary and secondary shuttles operate in a similar manner.

Each individual valve section has its own primary and secondary shuttle enclosed within the housing. The primary shuttle is responsible for separating the sense signal between the two work ports of an individual section. The secondary shuttle separates the signal between sections.

Operation of the shuttle is simply seating the ball opposite the side that has the highest pressure. This ensures that the signal sent to the pump is the highest pressure required from the implement valve sections.

NOTE: The three point hitch section has a "blind" primary shuttle. This is due to the three point hitch lift cylinders being single acting. No sense signal is sent to the pump when the three point hitch is being lowered.

Notice that the steering priority end cap has a secondary shuttle that separates the cab end implement valve from the steering system sense signal. If the steering pressure requirement is higher than the implement valve requirement, the steering circuit will supply the pump with the sense signal.

The steering priority end cap secondary shuttle has a 0.036" orifice opening. This orifice is used to provide a smooth sense signal to the pump during header auger operation, but also provides sufficient speed response for other hydraulic functions.

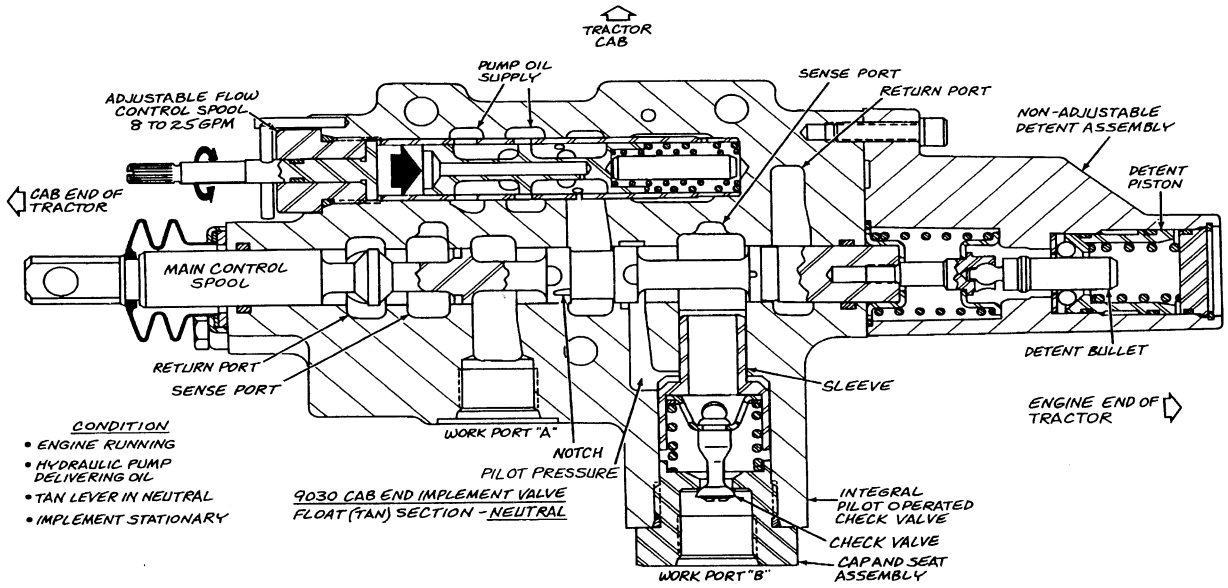


Figure 8-19

Float (Tan) Circuit

This section has a float position. Moving the control lever (or pedal) toward the cylinder extend position (away from the operator) as far as it will go, will lock the lever into the float position. The oil in the circuit is then free to circulate between pressure and return, allowing the implement to follow the contour of the ground. The lever can be moved from float back to neutral at any time.

CAUTION: DO NOT PLACE THE LEVER INTO THE FLOAT POSITION UNLESS THE IMPLEMENT IN ON THE GROUND. MOVING THE LEVER INTO FLOAT WITH THE IMPLEMENT RAISED WILL CAUSE THE IMPLEMENT TO FALL QUICKLY, POSSIBLY CAUSING DAMAGE.

The float section has an adjustable flow control (8-25 GPM). The flow can be adjusted by turning the flow control knob in the cab. This knob is mechanically connected to the flow control adjustment shaft on the valve. Turning the flow control knob will rotate a control sleeve that varies the amount a port in the sleeve is exposed to the work passage in the valve. A 8 GPM minimum flow requirement is necessary for proper operation of the pilot operated check on this valve section.

The pilot operated check valve is located in the "B" work port. This valve provides a hydraulic lock when the valve is in the neutral position provided the retract implement coupler is hooked to the retract port of the valve.

Float (Tan) Circuit - Neutral

When the lever is in the neutral position, the main control spool blocks both the supply and return flow paths through the valve and the implement remains stationary.

High Pressure Standby

1. Connect a flow meter across an implement valve section as shown in Figure 8-28.

   IMPORTANT: Be sure the flow from the pressure coupler is connected to the inlet side of the flow meter and that the outlet of the flow meter is connected to the return coupler, otherwise the flow meter may be damaged.

2. Hold the implement control valve in the open position and close the loading valve on the flow meter until maximum of 3000-3100 PSI is reached. At this time flow will have diminished to zero. System flow will normally start reducing at 2800 PSI and the pump will destroke to neutral by the time the maximum pressure is reached. If the system does not reach maximum pressure of 3000-3100 PSI, refer to the troubleshooting section.

Flow Control

1. Connect a flow meter across the implement valve section to be tested as shown in Figure 8-28.

   IMPORTANT: Be sure the flow from the pressure coupler is connected to the inlet side of the flow meter and that the outlet of the flow meter is connected to the return coupler, otherwise the flow meter may be damaged.

2. Set the flow control knob in the cab to the fully open position. Start the engine and increase engine speed to 2500 RPM.

3. Slowly close the loading valve of the flow control meter until the pressure is 2500 PSI. Flow should be at least 25 GPM.

4. Stop the engine and set the flow control knob in the cab to the minimum flow position. Open the loading valve on the flow meter.

5. Start the engine and increase the engine speed to 2500 RPM.

6. Slowly close the loading valve on the flow meter until the pressure is 2500 PSI. The flow on the detent (blue) and standard (green) circuits should be reduced to 2 GPM. The flow on the float circuit (tan) should be reduced to 8 GPM.

   NOTE: On the engine end implement valve, the flow control is adjusted manually. Due to increased line restriction, maximum flow will be approximately 21 GPM and minimum flow will be slightly less than 2 GPM.

Implement Valve Leak Down Test

1. Connect a flow meter across an implement valve section as shown in Figure 8-28.

   IMPORTANT: Be sure the flow from the pressure coupler is connected to the inlet side of the flow meter and that the outlet of the flow meter is connected to the return coupler, otherwise the flow meter may be damaged.

2. Start the engine and hold the implement control valve in the open position to circulate the hydraulics. Warm the hydraulic system to 122°F, then stop the engine and disconnect the flow meter.

DETENT DOES NOT RELEASE				
STEP	**PRETEST INSTRUCTIONS**	**TEST**	**RESULT**	**PROBABLE CAUSE AND CORRECTION**
1.	Engine running.	Perform "Detent Kick Out Pressure" test procedure in this section.	Detent pressure adjusted. Unable to properly adjust detent pressure.	Detent operating correctly. Go to next step.
2.	Engine off.	Back detent adjustment screw out several turns. Start engine and place implement control lever in the detent position.	Detent releases. Detent does not release.	Remove detent assembly from valve section. Inspect for worn or damaged parts. Repair or replace as necessary. Detent adjustment poppet stuck, probably because of overheating. Remove detent assembly from valve. Repair or replace as necessary. **NOTE: Holding the control lever in the detent position after the cylinder has reached its fully extended or retracted position will cause the hydraulics to generate excessive heat and will damage the detent assembly.**

Priority (Inlet) Section Assembly

1. Using a good grade of solvent, clean and blow dry all parts.
2. Inspect all finished surfaces for wear, scoring, nicks, or scratches.
3. Repair minor damage by buffing with crocus cloth. If the damage cannot be repaired by buffing, the component must be replaced.
4. Inspect the valve body castings for cracks or distortion.
5. Replace damaged parts as required.

   NOTE: Rebuild kits are available for the valve section. Refer to the Parts Catalog for details. Always use new kits when reassembling the valves.

6. Coat all finished surfaces with hydraulic fluid.
7. Install the secondary shuttle ball and shuttle seat, B, Figure 8-41.
8. Install a new O ring on the adjustment screw, M.
9. Insert the poppet, K, and spring, L, into the relief valve housing, J. Install the jam nut, N, on the adjustment screw.
10. Insert the spring, H, and flow control spool, I, into the flow control bore.
11. Install the relief valve housing assembly into the valve body. Torque to 20 ft. lbs. (27 N·m).

Installing the Cab End Implement Valve

1. With the cab tilted to the left, position the valve assembly under the valve mounting plate and secure to the plate with three bolts and nylon insert locknuts. Tighten the nuts securely.
2. If the tractor is equipped with a cab end three point hitch, connect the wire connectors to the solenoids:

- Raise - black/white and brown/white wires - coil farthest from the valve
- Lower - brown/white, white, and red/white wires - coil closest to the valve

3. Install the flow control cables to the detent, float and standard sections. Refer to Figure 8-52.
   a. Manually turn the flow control shaft on the valve to the low flow position.
   b. Turn the control knob in the cab to the low flow position.
   c. Engage the connector end of the flow control cable, 2, to the flow control shaft of the valve. Tighten the setscrew, 3.
4. Connect the control linkage clevis to each valve spool with pins and cotter pins, 1.
5. Connect the hydraulic hoses.
6. Refill the hydraulic reservoir and bleed the system as described in this section.

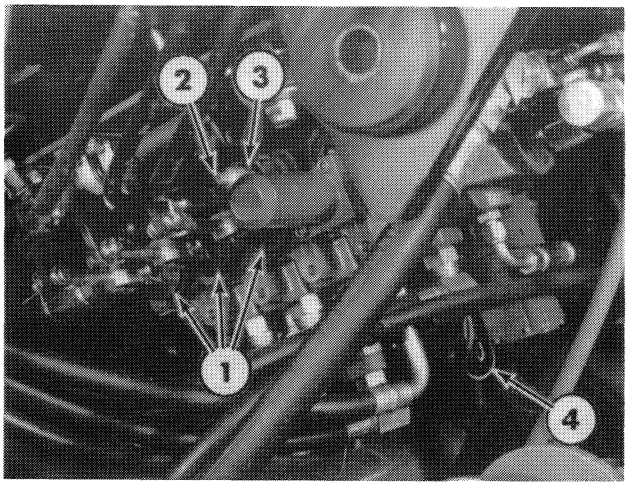


Figure 8-52

13. Remove quad ring seal from seal gland bushing.
14. Use a thin bladed screwdriver to pry dust seal from seal gland bushing. Do not damage bushing.

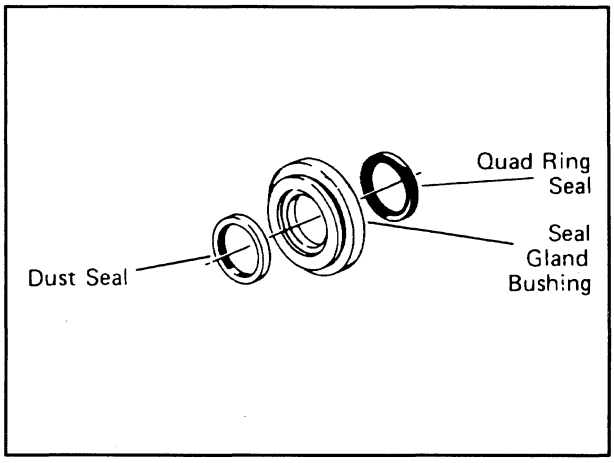


Figure 8-67

15. Remove two bearing races and the needle thrust bearing from spool and sleeve assembly.

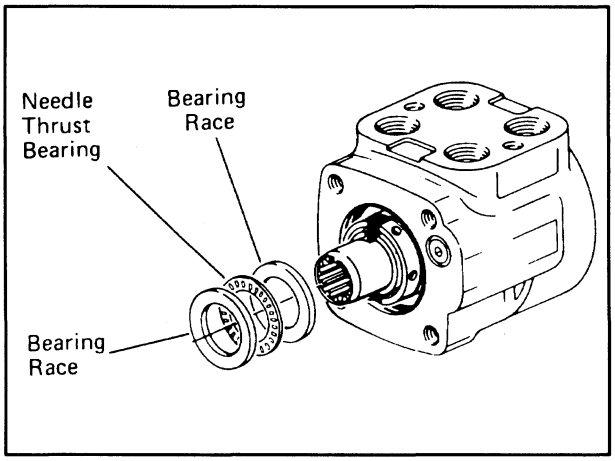


Figure 8-68

16. Remove spool and sleeve assembly from 14-hole end of housing.

    NOTE: The inner spool, sleeve, and housing are not replaceable separately because the parts are fitted at very close tolerances. If the problem with the steering control unit is with the spool, sleeve, or housing, replace the control assembly, or take it to an authorized Char-Lynn Service Center for rebuilding and testing.

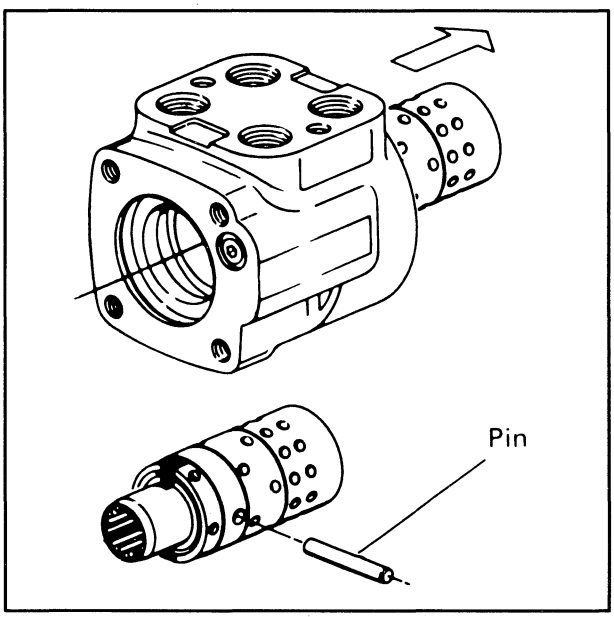


Figure 8-69

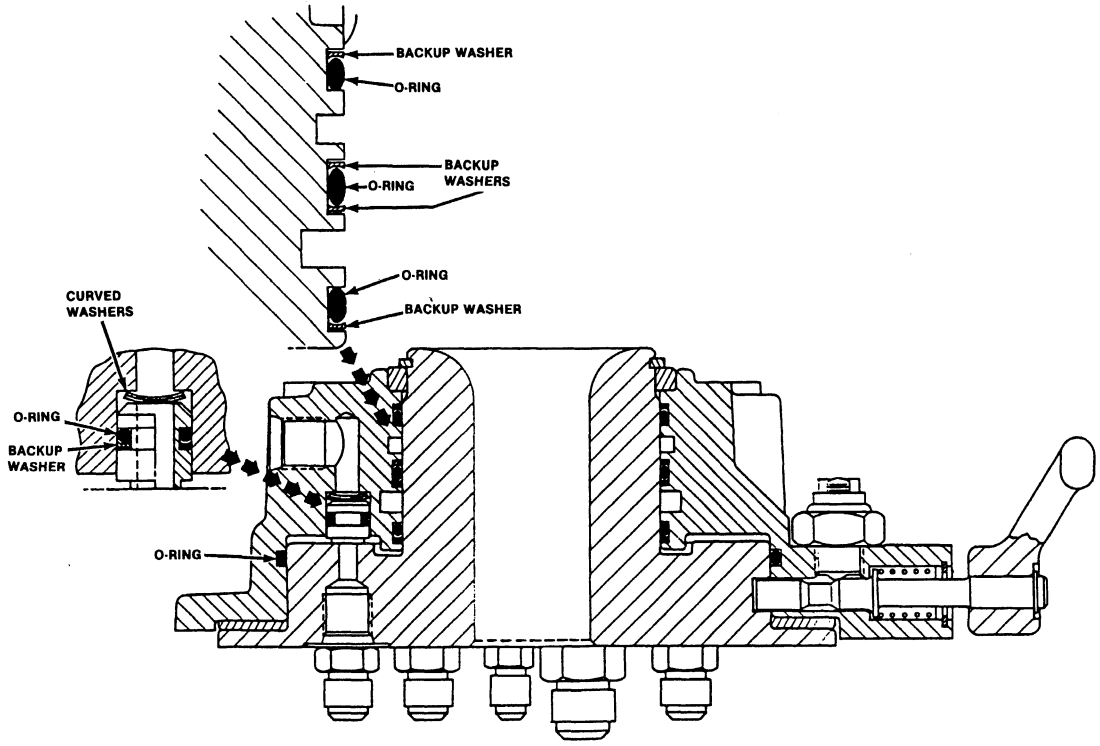


Figure 8-93

5. Install the three O rings, L, and four back-up washers, K, in the bore of the outer ring. Install a back-up washer on the top side of the O ring in the top groove, on each side of the O ring in the middle of the groove, and on the bottom side of the O ring in the lower groove. Refer to Figure 8-93 for the correct relationship of the parts to the outer ring of the rotary seat base.
6. Install a back-up washer and O ring on each valve seat, T. Place two curved washers in each valve seat bore and insert the valve seat. Refer to Figure 8-93 for the correct relationship of the parts to the outer ring of the rotary seat base.
7. Inset the lock pin, E, spring, F, and washer, G, in the bore in the outer ring and secure with the snap ring, H.
8. Install the handle, J, and secure with the snap ring, I.
9. Install the neutral safety switch, D, and torque to 40 ft. lbs. (54 N · m).
10. Place the lower bearing, M, on the inner ring, P.
11. Pull out the lock pin and carefully lower the outer ring, C, over the inner ring, P. Take care not to cut the O rings.
12. Install the snap ring, A.
13. Check that the assembly rotates smoothly in each direction and that the lock pin engages properly in each position.

6. Release the latch and tilt the cooler forward.
7. Remove the six cap screws, 1, Figure 8-111, and move the cooler out of its frame, 2, as far as possible.
8. Disconnect the A/C line, 5, Figure 8-110, and remove the cooler/condenser assembly.

   Straighten all bent fins. If any other repairs are required it must be done by a radiator specialist.

Installing the Oil Cooler

1. Position the cooler/condenser assembly in place and connect the A/C line, 5, Figure 8-110.
2. Secure the cooler to the frame with six cap screws, 1, Figure 8-111.
3. Rotate the frame back toward the radiator until it catches.
4. Connect the A/C line, 2, Figure 8-110, and the oil lines, 1 and 4. Tighten securely.
5. If the bypass valve, 3, Figure 8-110, was removed, reinstall it correctly noting the direction of flow.
6. Recharge the air conditioning system. Refer to Section 11, "Cab, Seat, Frame, and Environmental Systems".
7. Refill the hydraulic reservoir and bleed the system as described in this section.

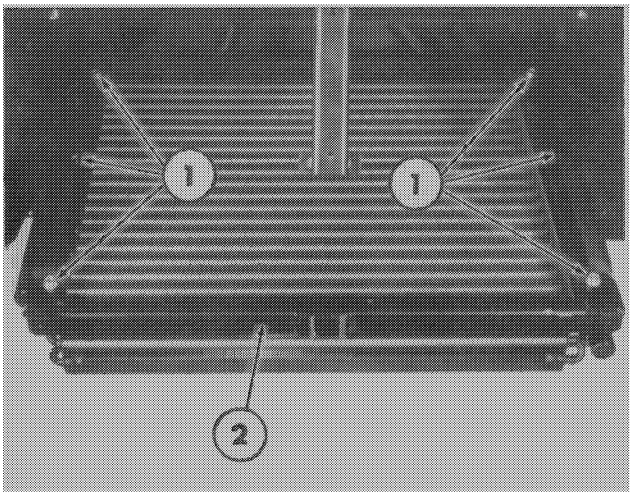


Figure 8-111

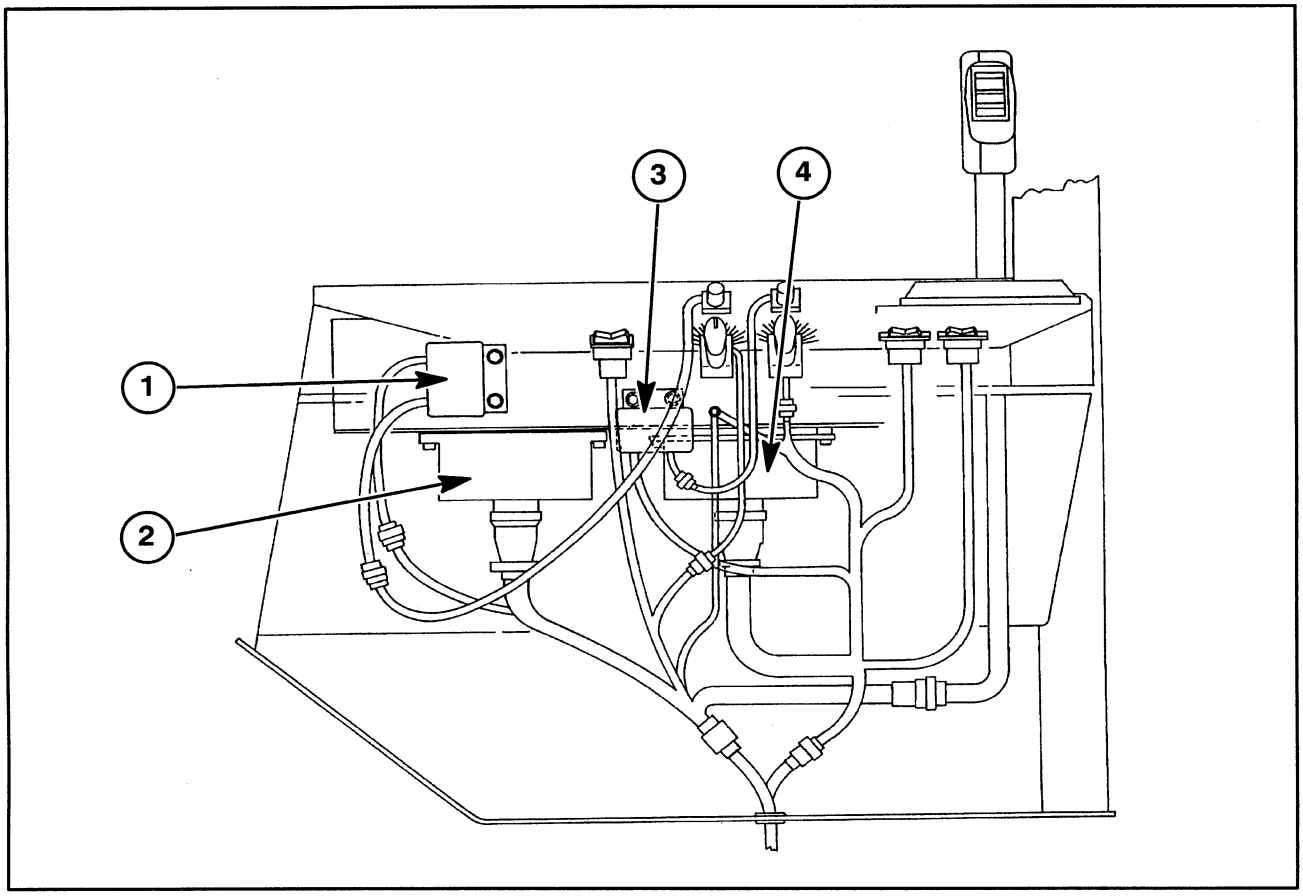


Figure 9-3

The left-hand console also houses the three-point hitch control components that are controlling the three-point hitch lift arms, based on the settings the operator has selected.

Figure 9-3 shows a side view of the left-hand side control console components. The following chart describes the function of each component:

ITEM	DESCRIPTION	FUNCTION
1	Cab-end lowering rate current controller.	Controls current flow to ground for the cab-end "lowering" solenoid, based on the position of the lower rate controller potentiometer.
2	Cab-end three-point hitch controller.	Controls operation of the cab-end three-point hitch when the automatic mode is selected. Has no effect on the system when the manual mode is selected.
3	Engine-end lowering rate current controller.	Controls current flow to ground for the engine-end "lowering" solenoid, based on the position of the lower rate controller potentiometer.
4	Engine-end three-point hitch controller.	Controls operation of the engine-end three-point hitch when the automatic mode is selected. Has no effect on the system when the manual mode is selected.

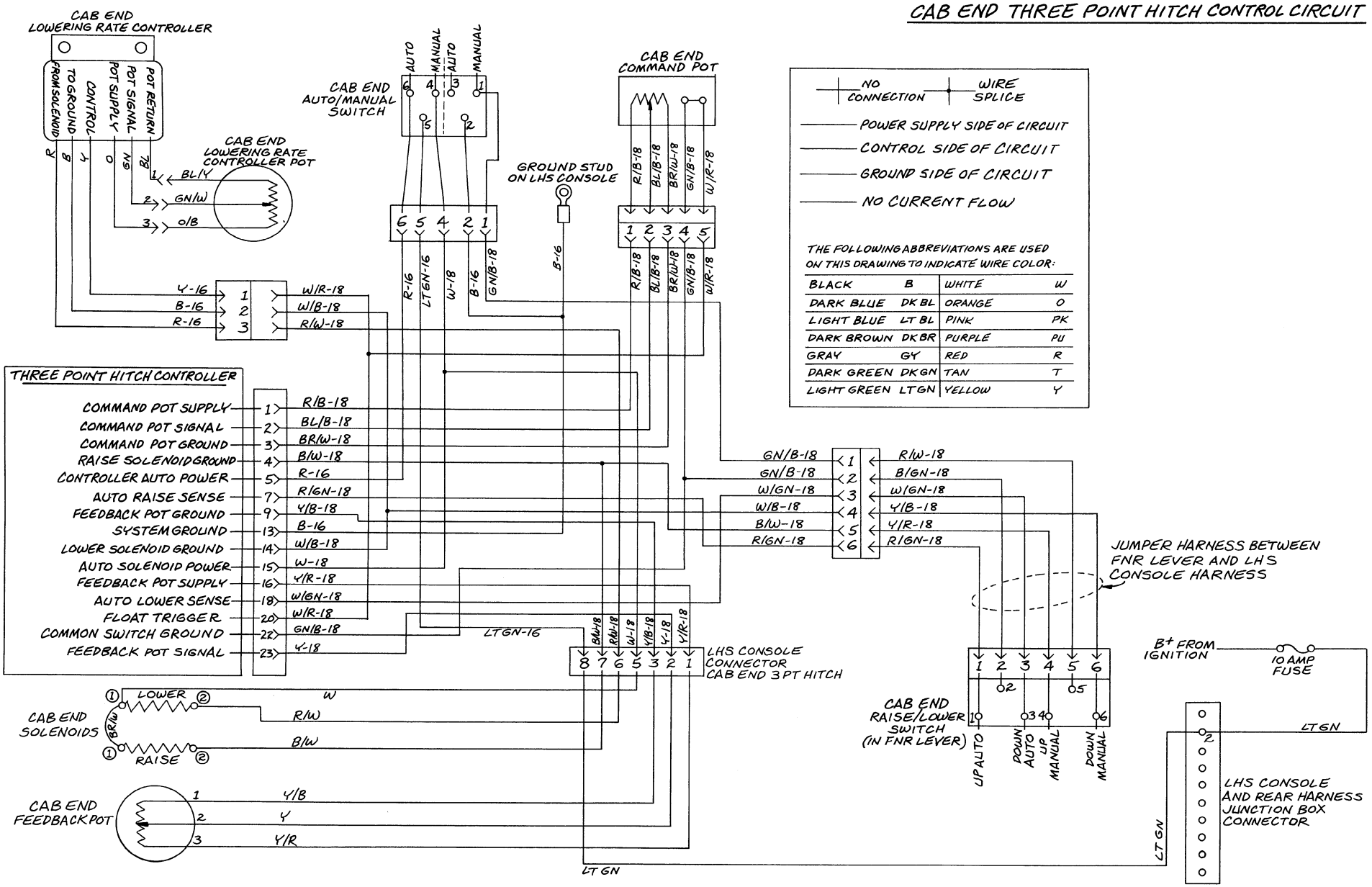

CAB END THREE POINT HITCH CONTROL CIRCUIT
CAB END LOWERING RATE CONTROLLER
FROM SOLENOID
TO GROUND
CONTROL
POT SUPPLY
POT SIGNAL
POT RETURN
CAB END LOWERING RATE CONTROLLER POT
BL/Y
GN/W
O/B
CAB END AUTO/MANUAL SWITCH
AUTO
MANUAL
AUTO
MANUAL
CAB END COMMAND POT
GROUND STUD ON LHS CONSOLE
NO CONNECTION
WIRE SPLICE
POWER SUPPLY SIDE OF CIRCUIT
CONTROL SIDE OF CIRCUIT
GROUND SIDE OF CIRCUIT
NO CURRENT FLOW
THE FOLLOWING ABBREVIATIONS ARE USED ON THIS DRAWING TO INDICATE WIRE COLOR:
BLACK B
WHITE W
DARK BLUE DK BL
ORANGE O
LIGHT BLUE LT BL
PINK PK
DARK BROWN DK BR
PURPLE PU
GRAY GY
RED R
DARK GREEN DK GN
TAN T
LIGHT GREEN LT GN
YELLOW Y
THREE POINT HITCH CONTROLLER
COMMAND POT SUPPLY
COMMAND POT SIGNAL
COMMAND POT GROUND
RAISE SOLENOID GROUND
CONTROLLER AUTO POWER
AUTO RAISE SENSE
FEEDBACK POT GROUND
SYSTEM GROUND
LOWER SOLENOID GROUND
AUTO SOLENOID POWER
FEEDBACK POT SUPPLY
AUTO LOWER SENSE
FLOAT TRIGGER
COMMON SWITCH GROUND
FEEDBACK POT SIGNAL
JUMPER HARNESS BETWEEN FNR LEVER AND LHS CONSOLE HARNESS
LHS CONSOLE CONNECTOR CAB END 3PT HITCH
CAB END SOLENOIDS
LOWER
RAISE
CAB END FEEDBACK POT
CAB END RAISE/LOWER SWITCH (IN FNR LEVER)
UP AUTO
DOWN AUTO
UP MANUAL
DOWN MANUAL
B+ FROM IGNITION
10 AMP FUSE
LHS CONSOLE AND REAR HARNESS JUNCTION BOX CONNECTOR
LT GN

Figure 9A-1

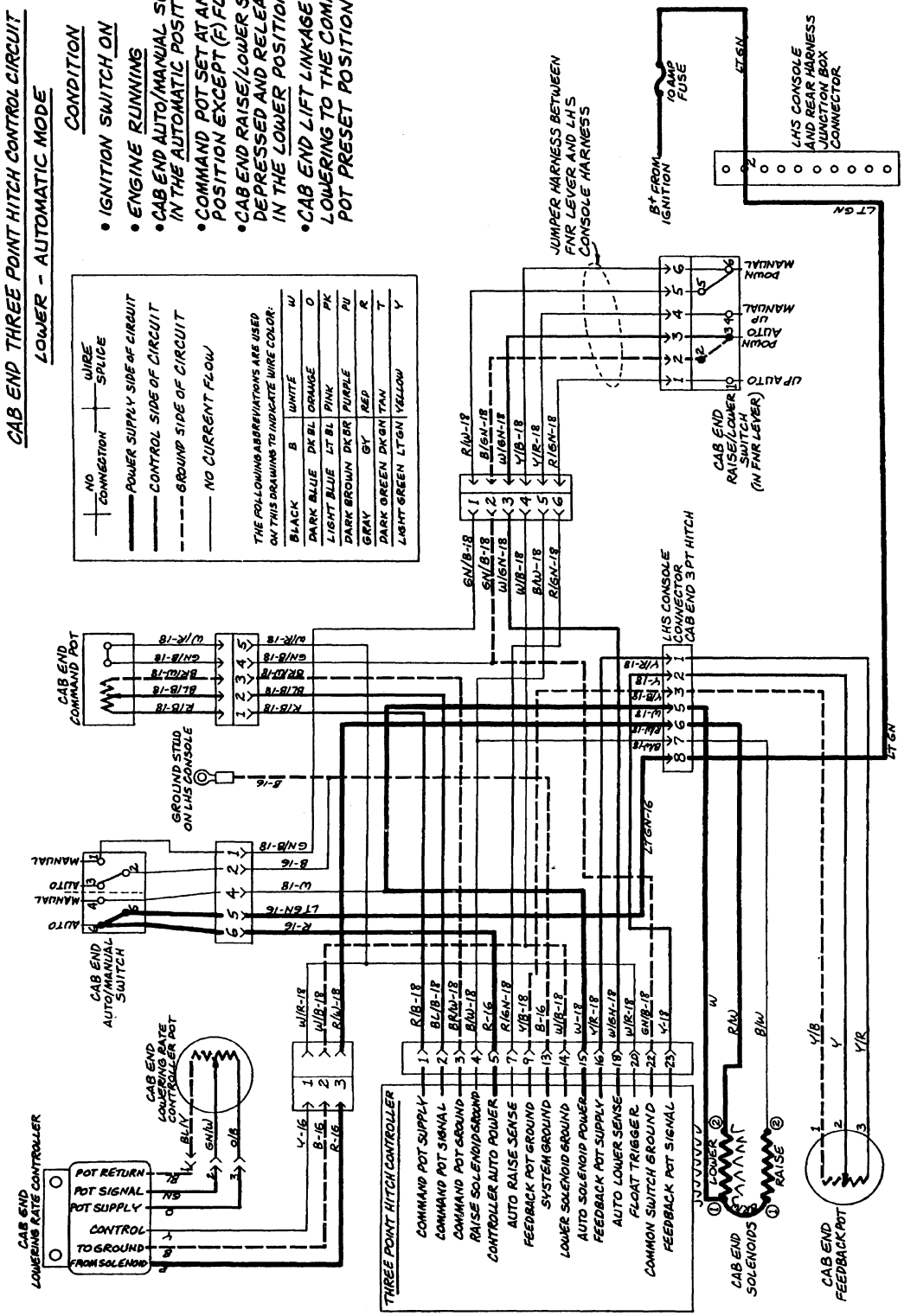

CAB END THREE POINT HITCH CONTROL CIRCUIT
LOWER - AUTOMATIC MODE
CONDITION
• IGNITION SWITCH ON
• ENGINE RUNNING
• CAB END AUTO/MANUAL SWITCH IN THE AUTOMATIC POSITION
• COMMAND POT SET AT ANY POSITION EXCEPT (F) FLOAT
• CAB END RAISE/LOWER SWITCH DEPRESSED AND RELEASED IN THE LOWER POSITION
• CAB END LIFT LINKAGE LOWERING TO THE COMMAND POT PRESET POSITION
NO CONNECTION
WIRE SPLICE
POWER SUPPLY SIDE OF CIRCUIT
CONTROL SIDE OF CIRCUIT
GROUND SIDE OF CIRCUIT
NO CURRENT FLOW
THE FOLLOWING ABBREVIATIONS ARE USED ON THIS DRAWING TO INDICATE WIRE COLOR:
BLACK B WHITE W
DARK BLUE DK BL ORANGE O
LIGHT BLUE LT BL PINK PK
DARK BROWN DK BR PURPLE PU
GRAY GY RED R
DARK GREEN DK GN TAN T
LIGHT GREEN LT GN YELLOW Y
JUMPER HARNESS BETWEEN FNR LEVER AND LHS CONSOLE HARNESS
B+ FROM IGNITION
10 AMP FUSE
LT GN
LHS CONSOLE AND REAR HARNESS JUNCTION BOX CONNECTOR
CAB END RAISE/LOWER SWITCH (IN FNR LEVER)
UP AUTO
POWN AUTO
UP MANUAL
DOWN MANUAL
LHS CONSOLE CONNECTOR CAB END 3PT HITCH
CAB END COMMAND POT
GROUND STUD ON LHS CONSOLE
CAB END AUTO/MANUAL SWITCH
MANUAL
AUTO
CAB END LOWERING RATE CONTROLLER POT
CAB END LOWERING RATE CONTROLLER
POT RETURN
POT SIGNAL
POT SUPPLY
CONTROL
TO GROUND
FROM SOLENOID
THREE POINT HITCH CONTROLLER
COMMAND POT SUPPLY
COMMAND POT SIGNAL
COMMAND POT GROUND
RAISE SOLENOID GROUND
CONTROLLER AUTO POWER
AUTO RAISE SENSE
FEEDBACK POT GROUND
SYSTEM GROUND
LOWER SOLENOID GROUND
AUTO SOLENOID POWER
FEEDBACK POT SUPPLY
AUTO LOWER SENSE
FLOAT TRIGGER
COMMON SWITCH GROUND
FEEDBACK POT SIGNAL
CAB END SOLENOIDS
LOWER
RAISE
CAB END FEEDBACK POT

Figure 9A-7

RAISE - MANUAL MODE (REFERENCE FIGURE 9A-12)

When the engine-end three-point hitch is in the **manual raise** mode, the following criteria are met:

- Ignition switch in the "ON" position.
- Engine is running and the hydraulic pump is supplying oil to the engine-end implement valve.
- The engine-end auto/manual switch is in the manual mode position.
- The engine-end raise/lower switch is depressed and held in the raise position.
- The engine-end lift linkage is raising.

Figure 9A-12 shows the circuit during manual raise. The power supply side of the circuit is identical to the neutral manual mode circuit on Figure 9A-11. The operator has now given a path to ground for the raise solenoid by depressing and holding the raise/lower switch in the raise position. The circuit to ground is now complete by current flowing out of the auto/manual switch to the ground stud on the left-hand side console. The solenoid activates and the lift linkage will raise until either the operator releases the switch or the lift linkage reaches the top of the lift cylinder stroke.

Notice that there is no current regulation in the raise circuit. The rate at which the lift linkage raises can only be affected by the speed of the engine turning the hydraulic pump. The three-point hitch control valve has a fixed/non-adjustable 8 gpm flow control included in it.

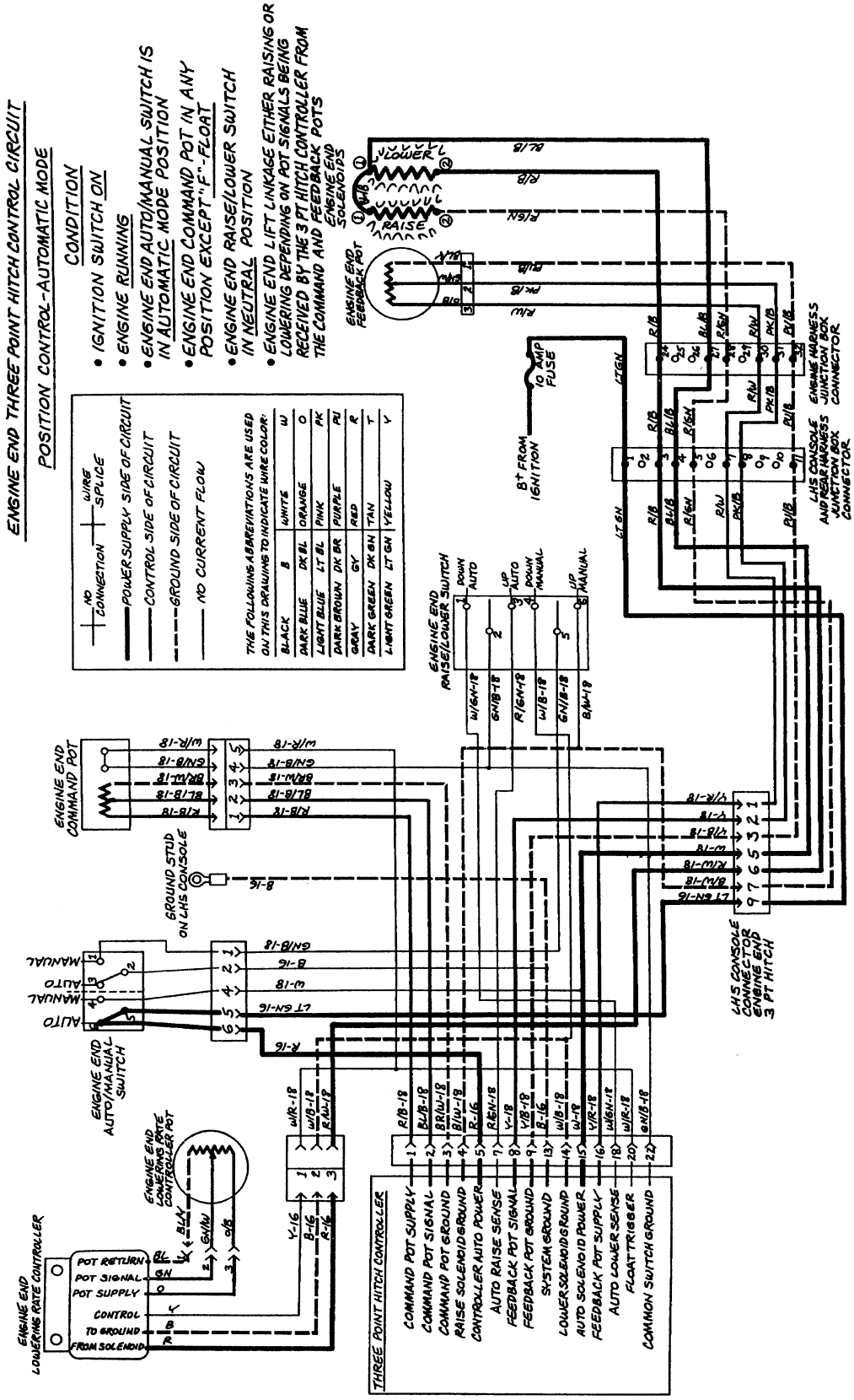
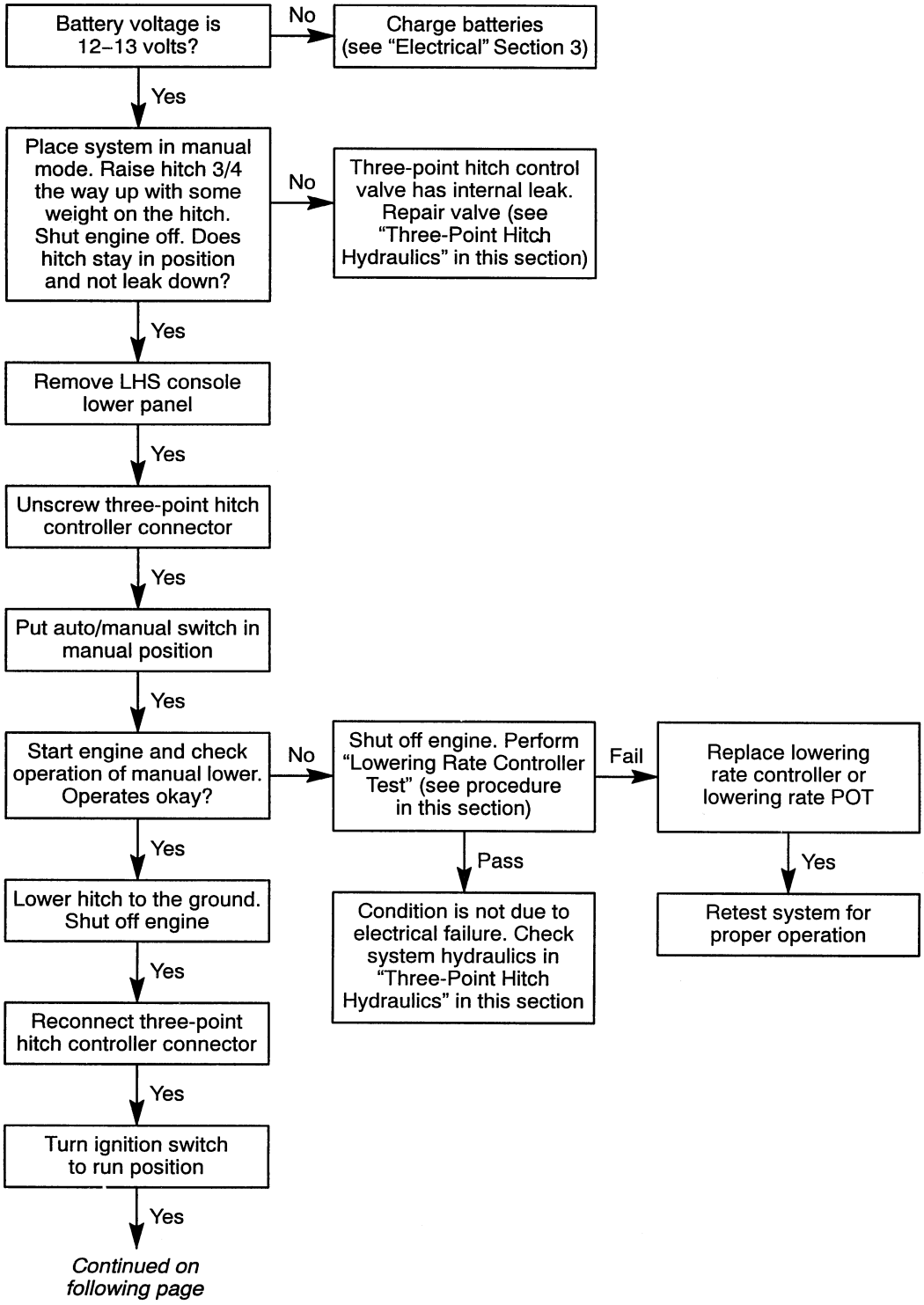

ENGINE END THREE POINT HITCH CONTROL CIRCUIT
POSITION CONTROL-AUTOMATIC MODE
CONDITION
• IGNITION SWITCH ON
• ENGINE RUNNING
• ENGINE END AUTO/MANUAL SWITCH IS IN AUTOMATIC MODE POSITION
• ENGINE END COMMAND POT IN ANY POSITION EXCEPT "F"-FLOAT
• ENGINE END RAISE/LOWER SWITCH IN NEUTRAL POSITION
• ENGINE END LIFT LINKAGE EITHER RAISING OR LOWERING DEPENDING ON POT SIGNALS BEING RECEIVED BY THE 3 PT HITCH CONTROLLER FROM THE COMMAND AND FEEDBACK POTS
NO CONNECTION
WIRE SPLICE
POWER SUPPLY SIDE OF CIRCUIT
CONTROL SIDE OF CIRCUIT
GROUND SIDE OF CIRCUIT
NO CURRENT FLOW
THE FOLLOWING ABBREVIATIONS ARE USED ON THIS DRAWING TO INDICATE WIRE COLOR:
BLACK B
DARK BLUE DK BL
LIGHT BLUE LT BL
DARK BROWN DK BR
GRAY GY
DARK GREEN DK GN
LIGHT GREEN LT GN
WHITE W
ORANGE O
PINK PK
PURPLE PU
RED R
TAN T
YELLOW Y
ENGINE END FEEDBACK POT
ENGINE END SOLENOIDS
LOWER
RAISE
B+ FROM IGNITION
10 AMP FUSE
IGN
LT GN
LHS CONSOLE AND ENGINE HARNESS JUNCTION BOX CONNECTOR
ENGINE HARNESS JUNCTION BOX CONNECTOR
ENGINE END RAISE/LOWER SWITCH
DOWN AUTO
UP AUTO
DOWN MANUAL
UP MANUAL
ENGINE END COMMAND POT
GROUND STUD ON LHS CONSOLE
MANUAL
AUTO
MANUAL
AUTO
ENGINE END AUTO/MANUAL SWITCH
ENGINE END LOWERING RATE CONTROLLER POT
ENGINE END LOWERING RATE CONTROLLER
POT RETURN
POT SIGNAL
POT SUPPLY
CONTROL
TO GROUND
FROM SOLENOID
LHS CONSOLE CONNECTOR ENGINE END 3 PT HITCH
THREE POINT HITCH CONTROLLER
COMMAND POT SUPPLY
COMMAND POT SIGNAL
COMMAND POT GROUND
RAISE SOLENOID GROUND
CONTROLLER AUTO POWER
AUTO RAISE SENSE
FEEDBACK POT SIGNAL
FEEDBACK POT GROUND
SYSTEM GROUND
LOWER SOLENOID GROUND
AUTO SOLENOID POWER
FEEDBACK POT SUPPLY
AUTO LOWER SENSE
FLOAT TRIGGER
COMMON SWITCH GROUND

Figure 9A-18

Cab End Three-Point Hitch—Manual or Automatic Mode—Cannot Control the Drop Rate of the Hitch When Lowering (Every Mode Except Automatic Float)

Reference Figure 9A-4 or 9A-7



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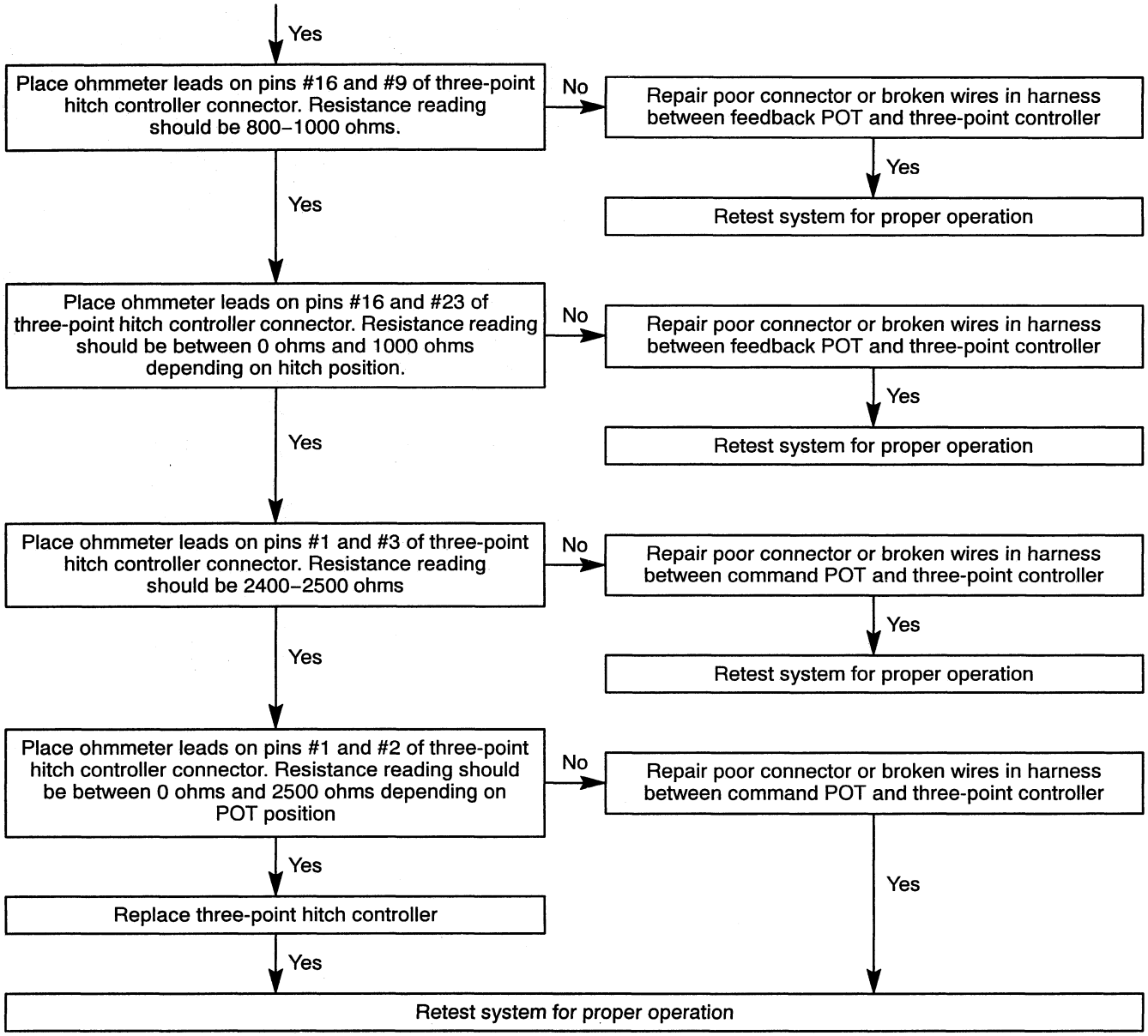
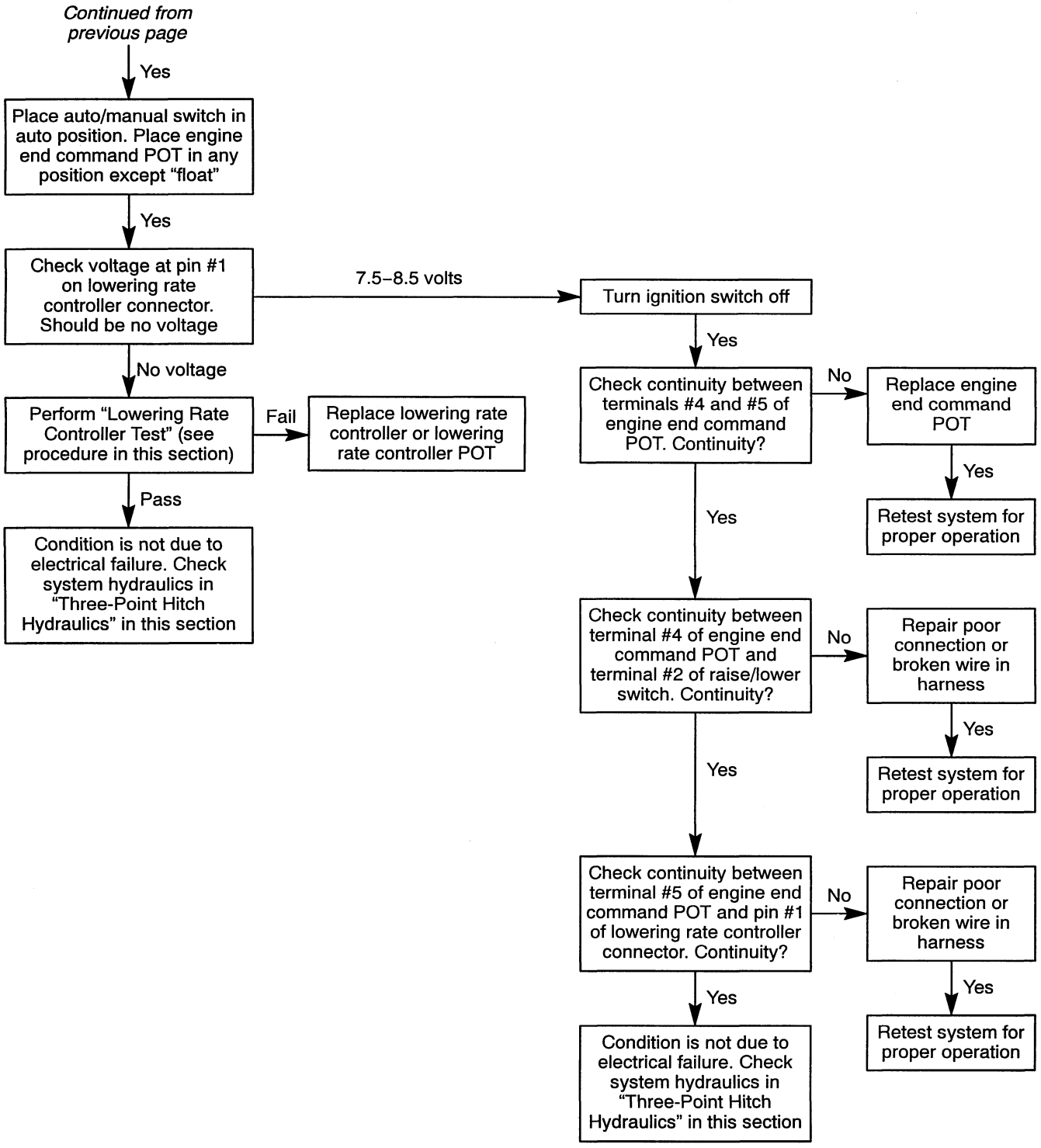
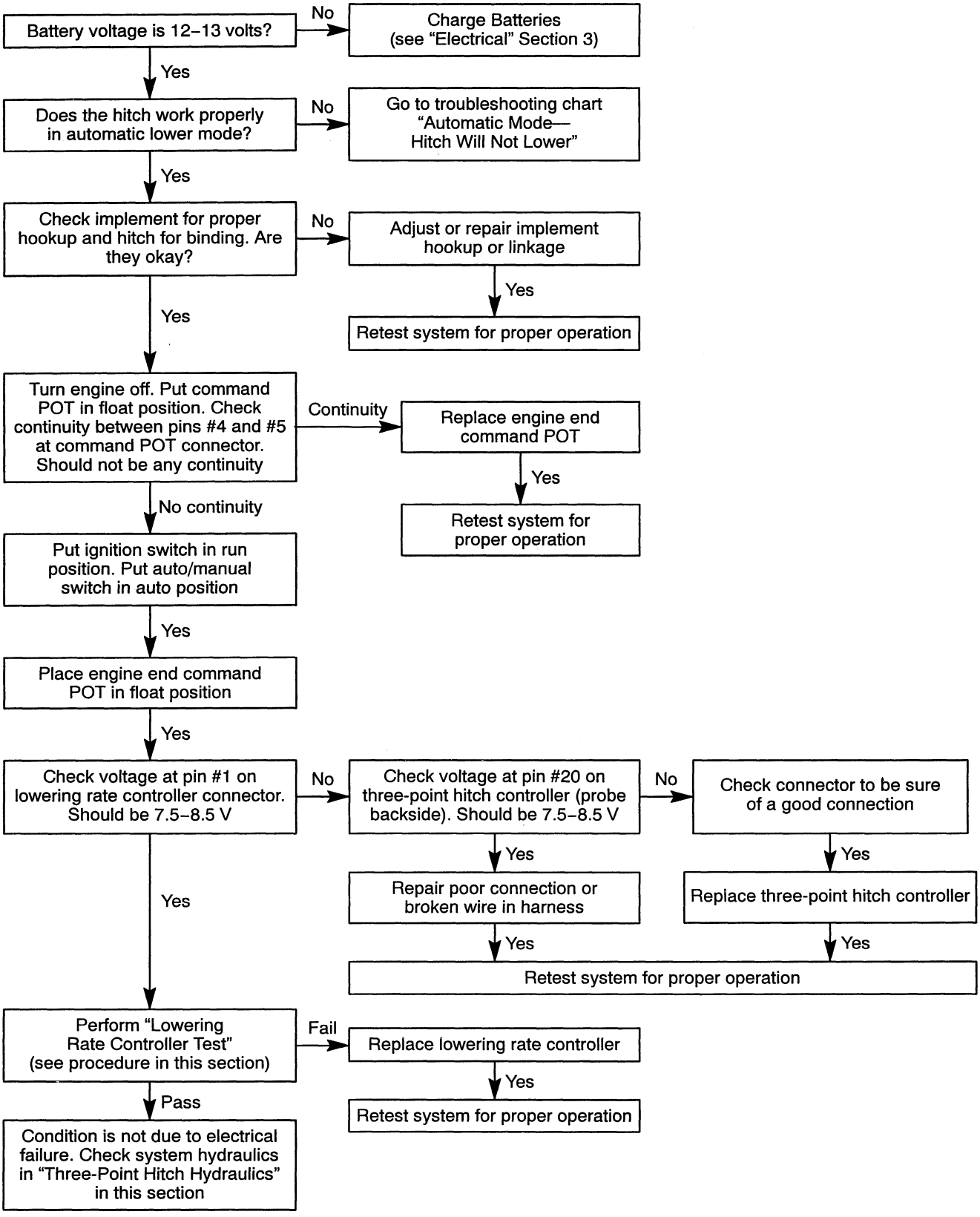



Continued from previous page
Yes
Place auto/manual switch in auto position. Place engine end command POT in any position except "float"
Yes
Check voltage at pin #1 on lowering rate controller connector. Should be no voltage
7.5–8.5 volts
Turn ignition switch off
Yes
No voltage
Perform "Lowering Rate Controller Test" (see procedure in this section)
Fail
Replace lowering rate controller or lowering rate controller POT
Pass
Condition is not due to electrical failure. Check system hydraulics in "Three-Point Hitch Hydraulics" in this section
Check continuity between terminals #4 and #5 of engine end command POT. Continuity?
No
Replace engine end command POT
Yes
Retest system for proper operation
Yes
Check continuity between terminal #4 of engine end command POT and terminal #2 of raise/lower switch. Continuity?
No
Repair poor connection or broken wire in harness
Yes
Retest system for proper operation
Yes
Check continuity between terminal #5 of engine end command POT and pin #1 of lowering rate controller connector. Continuity?
No
Repair poor connection or broken wire in harness
Yes
Retest system for proper operation
Yes
Condition is not due to electrical failure. Check system hydraulics in "Three-Point Hitch Hydraulics" in this section

Engine End Three-Point Hitch—Automatic Mode— Hitch Will Not Go Into Float Mode

Reference Figure 9A-17



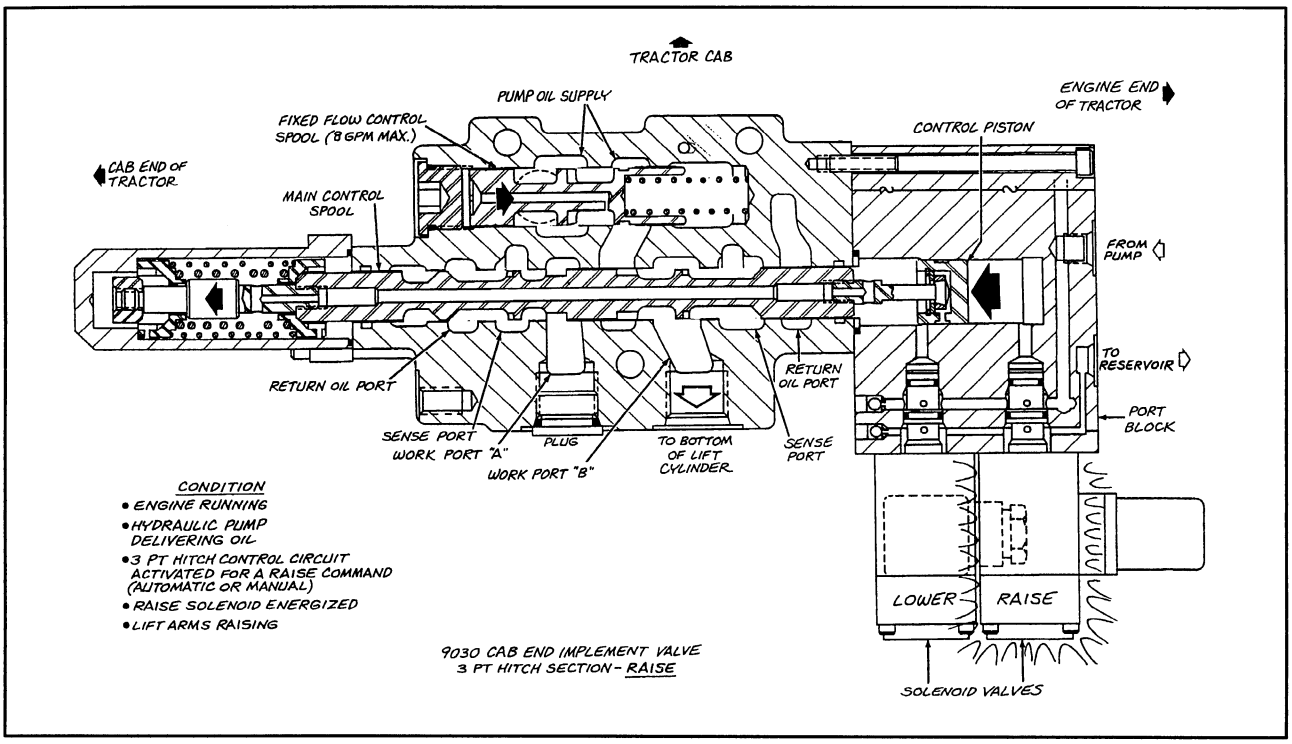


Figure 9B-3

THREE-POINT HITCH SECTION - RAISE

When the raise solenoid is energized, oil is allowed to pass through center of the pressure reducing valve to the right end of the control piston. This shifts the main control spool to the left and allows the pressure oil to pass through the valve to the work port and on to the bottom of the lift cylinder, causing the lift arms to raise.

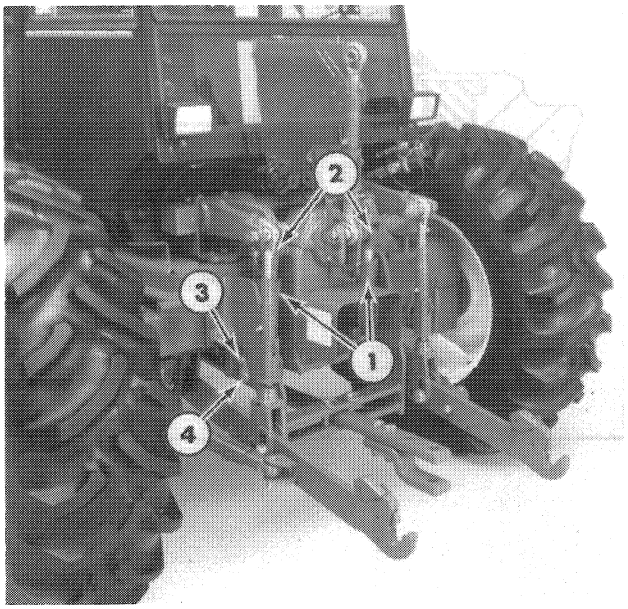


Figure 9B-11

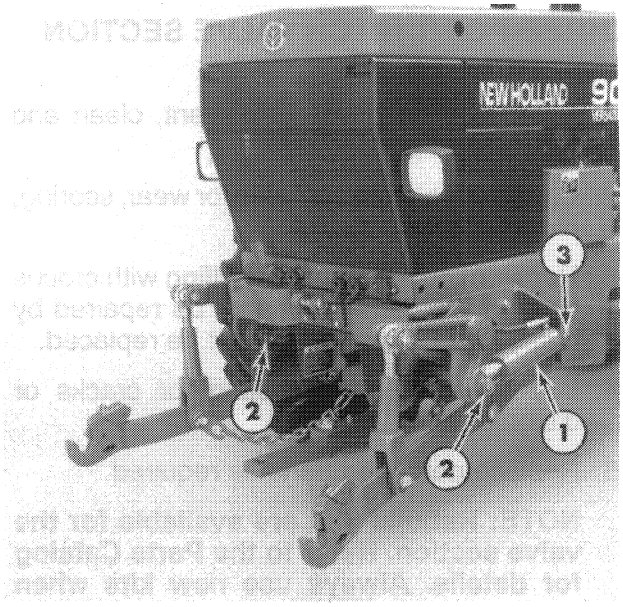


Figure 9B-12

REMOVING THE CAB-END LIFT CYLINDERS

1. Disconnect and cap the hydraulic lines to the cylinders.
2. Remove the cylinder top pins, 2.
3. Remove cap screws, 3, and remove the cylinder bottom pins, 4, and remove the cylinders, 1.

REMOVING THE ENGINE-END LIFT CYLINDERS

1. Disconnect and cap the hydraulic lines to the cylinders.
2. Remove the cylinder pin, 2.
3. Remove cap screw, 3, and remove the cylinder, 1.

TIRE INFLATION

Inflate the tires as recommended in Figure 10-8.

IMPORTANT: Increase the tire pressure in the wheels running in the furrow in applications such as plowing. The pressure on these tires should be increased by 4 psi (0.3 bar). When plowing or discing, pull the implement from the cab end, not the engine end.

NOTE: Duals may be used with a smaller (next size) as an outside dual. If the same size is used for both inner and outer, the air pressure must be reduced in the outer.

WEIGHTING LIMITATIONS

- Maximum permissible tractor weight including ballast and mounted equipment not to exceed 16,000 lbs. (7270 kg).
- Maximum permissible cab and axle loading with ballast and mounted equipment not to exceed 12,000 lbs. (5455 kg).
- Maximum permissible engine and axle loading with ballast and mounted equipment not to exceed 10,000 lbs. (4545 kg).

NOTE: The tractor ballasted weight must not exceed 16,000 lbs. (7270 kg) which is the maximum tractor operating weight allowed. The weight includes the loader and the load in the bucket, if equipped with a loader.

NOTE: Individual allowable axle weight.

Engine End Axle	**Cab End Axle**
lbs. up to 10,000	lbs. up to 12,000
kgs. up to 4545	kgs. up to 5454

Ideal weighting is all four wheels pulling an equal share of the load, equally ballasted.

BALLASTING RECOMMENDATIONS

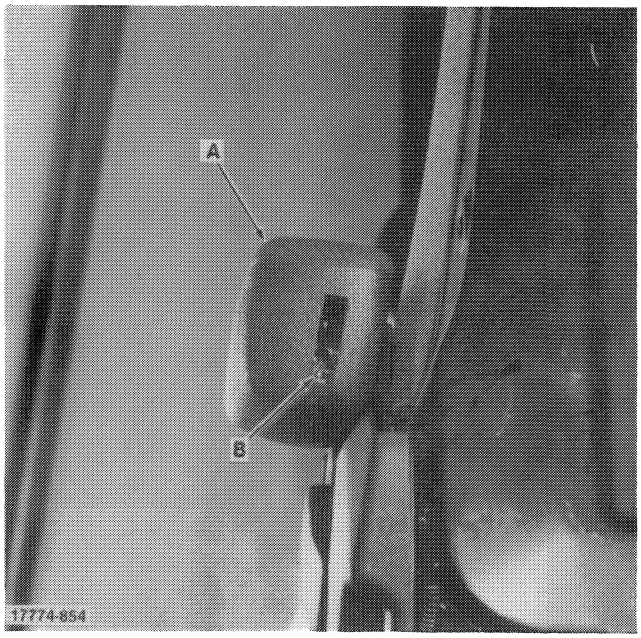
- For loader applications, add ballast to the engine end tires. For continuous heavy loader operation, and for tractors not equipped with engine PTO and 3-pt. hitch, add a cast iron weight kit (engine end suitcase weights). Add nothing to the cab end tires when using cab end attachments (loader, auger header, etc.).
- Recommended operating weight of the tractor including ballast and mounted equipment for field applications:

  up to 13,500 lbs (6135 kg)

TIRE COMBINATIONS AND INFLATION PRESSURES - LBS. (BAR)						
TIRE SIZE	**LOAD LIMIT IN POUND AT VARIOUS COLD INFLATION PRESSURES**					
	12 (0.8)	**14 (1.0)**	**16 (1.1)**	**18 (1.2)**	**20 (1.4)**	**22 (1.5)**
Singles 14.9-28	2630	2880	3120	3340	3550	3750
Duals 14.9-28	2310	2530	2750	2940	3120	3300
Singles 16.9-28	3340	3550	3780	4050	4130	4560
Duals 16.9-28	2940	3120	3330	3560	3790	4010

Figure 10 -8

Tire Inflation Chart



Armrest **FIGURE 11B-3**

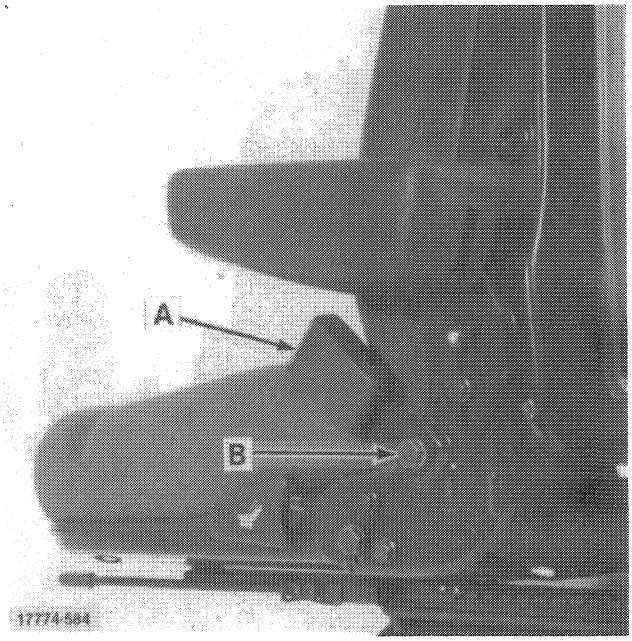
A Armrest
B Slotted screw

ARMREST - REMOVAL

1. Rotate the armrest, A, Figure 11B-3, until it is horizontal.
2. Using a blade type screwdriver remove slotted screw, B.
3. Pull the armrest from the support.

ARMREST - INSTALLATION

1. Slide the armrest onto the support.
2. Insert the screw, B, Figure 11B-3, and tighten securely.



Seat Belt **FIGURE 11B-4**

A Seat belt
B Seat belt bolt

SEAT BELT - REMOVAL

1. Rotate the armrest to the vertical position and remove the trim piece covering the seat belt attaching bolt. The trim piece will pull off.
2. Remove bolt, B, Figure 11B-4, and remove the seat belt, A.

SEAT BELT - INSTALLATION

1. Position the seat belt and secure with bolt, B, Figure 11B-4. Torque the bolt to 60 ft. lbs. (81 N·m).
2. Attach the trim piece to the seat frame by snapping it back into position.

TROUBLESHOOTING - HEATING SYSTEM

PROBLEM	POSSIBLE CAUSE	CORRECTION
No heat	Low coolant level	Replenish coolant
	Air in heater/evaporator core	Bleed system
	Defective engine thermostat	Replace thermostat
	Pinched heater hose	Check hoses
	Temperature control valve plugged	Clean or replace valve and flush system
	Heater shut-off valve closed	Open valve
	Heater shut-off valve installed backwards	Reposition valve
Coolant smell in cab	Heater/evaporator leaking	Repair or replace heater/evaporator core
	Heater hose leaking	Repair or replace hose
	Temperature control valve leaking	Replace temperature control valve
Insufficient air flow	Cab air filter plugged	Clean or replace filter
	Faulty blower	Repair or replace blower
	Heater/evaporator core fins plugged	Clean heater/evaporator core
	One or more cab air ducts disconnected	Reconnect cab air duct(s)
	Air intake on cab plugged	Remove obstruction (shipping foam)
Noisy system	Faulty blower	Repair or replace blower
No air flow	Faulty blower switch	Replace switch
	Faulty blower	Repair or replace blower
	One or more cab air ducts disconnected	Reconnect cab air duct (s)
Excessive heat	Heater hose improperly connected	Reconnect hose to proper position
	Defective engine thermostat	Replace engine thermostat
	Plugged radiator fins	Clean radiator fins

Attach the end of the new hose to the heavy fish line and reverse the procedure. An assistant is required to help feed the hose into the cab pillar.

Tighten all clamps. Bleed the air from the heater/evaporator core by following steps 8, 9, and 10, in "Heater/Evaporator Core - Installation" in this section. Replace the cab trim pieces removed.

The entire hose does not have to be replaced if it has be damaged in one place. If the hose has collapsed for any reason it must be replaced.

If a leak is detected and a small piece of heater hose must be replaced, pinch the hose 6″ from either side of the leak and cut out the defective piece. Use a 5/8″ hose barb and hose clamps to secure the replacement section and then bleed the system using Steps 8, 9, and 10 in "Heater/Evaporator Core - Installation".

TROUBLESHOOTING & TESTING - GENERAL (R12 AND R134A SYSTEMS)

GENERAL SAFETY AND SERVICE PRECAUTIONS

All refrigerants have potentially dangerous physical and chemical properties. All refrigerants are stored under relatively high pressure as a liquid, and all of them are chemicals which can be harmful or fatal if not treated properly. When not used as directed you could be exposed to physical injury, frostbite, blindness, possible poisoning and/or death by asphyxiation, or cardiac arrest. In addition, some of the new refrigerants including R134A have been found to be flammable under certain conditions.

The following safety warnings are generally recognized as minimum precautions that must be observed when servicing air conditioning systems.

1. Read, understand, and follow the instructions provided by the manufacturer of all the service equipment with which you will be working and of the tractor being serviced.
2. Wear safety goggles at all times when servicing an air conditioning system, extraction or recycling equipment, or otherwise handling refrigerant. Liquid splashed in the eye can cause frostbite and/or irritation.

   Wear appropriate rubber gloves and other protective clothing. Extreme care should be used when handling R134A and R12 in order to prevent contact with skin and other body parts. This is to prevent freezing of body tissues.

   Read and follow the information in the material safety data sheet provided by your refrigerant supplier regarding the proper handling of refrigerant.

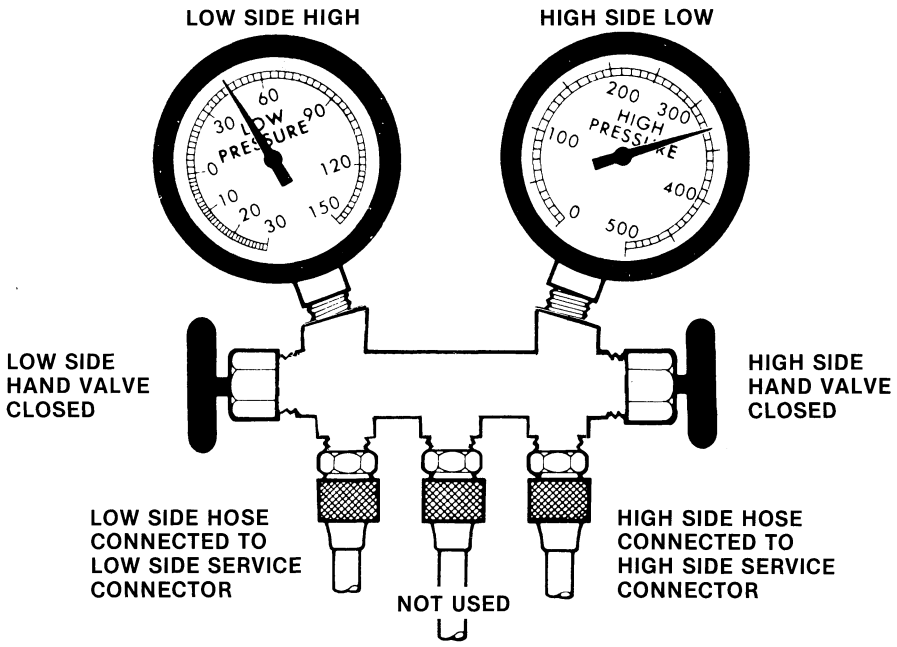
3. **CAUTION: AVOID BREATHING A/C REFRIGERANT AND LUBRICANT VAPOR OR MIST. EXPOSURE MAY IRRITATE EYES, NOSE, AND THROAT. TO REMOVE REFRIGERANT FROM THE A/C SYSTEM, USE SERVICE EQUIPMENT CERTIFIED TO MEET THE REQUIREMENTS OF SAE STANDARDS. IF ACCIDENTAL SYSTEM DISCHARGE OCCURS, VENTILATE WORK AREA BEFORE RESUMING SERVICE. ADDITIONAL HEALTH AND SAFETY INFORMATION MAY BE OBTAINED FROM REFRIGERANT AND LUBRICANT MANUFACTURERS.**
4. Never mix R134A with air for leak testing. In general, it should not be used or allowed to be present with high concentrations of air above atmospheric pressure. It has been determined that pressurized, air rich mixtures of R134A and air can undergo combustion when exposed to an ignition source.
5. Never perform operations other than routine maintenance on your extraction or recycling equipment without first consulting the manufacturers' authorized personnel. Removal of fittings and filters can cause refrigerant under pressure to escape. Use the proper safety equipment, including safety goggles.
6. Never service or maintain extraction or recycling equipment while it is plugged in unless proper service procedures direct you to do so.
7. Always transfer refrigerant to cylinders or tanks specifically approved for refilling by the U.S. Department of Transportation. The designations "DOT 4BW" or "DOT 4BA" indicate such approval. Use no other containers.

Gauge Readings and Interpretations - R12 Equipped Tractors

EXAMPLE 5:

PROBLEM: Insufficient or no cooling.
Engine overheats in some cases.

CAUSE: Condenser not functioning properly.



CONDITIONS*

1. Low side pressure too high. Gauge should read 15-30 psi (1-2 bar).
2. High side pressure too high. Gauge should read 185-205 psi (13-14 bar).
3. Occasional bubbles in sight glass.
4. Condenser outlet line is hot.
5. Evaporator air warm.

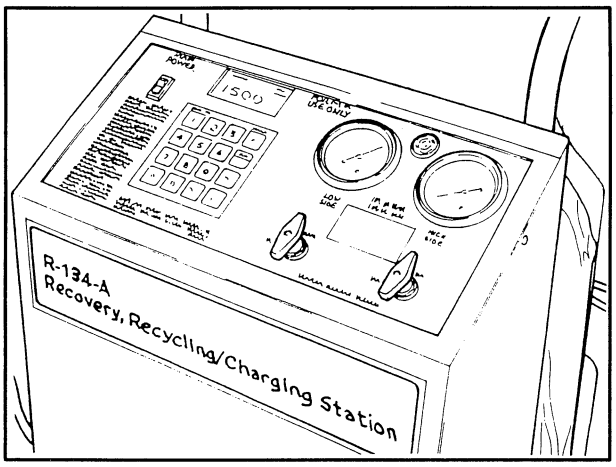
CORRECTIVE PROCEDURES

1. Check belt tension. Loose or worn drive belts could cause excessive pressures in the compressor head.
2. Look for clogged passages between the condenser fins and coil, or other obstructions that could reduce condenser airflow.
3. If engine overheating is a symptom, check radiator fan, and pressure cap for proper operation.

(Continued).

DIAGNOSIS: Lack of cooling caused by pressure that is too high on the high side, resulting from improper operation of condenser. (Refrigerant charge may be normal or excessive).

SYMPTOM	POSSIBLE CAUSE	REMEDY
Insufficient Pressure - Low Side	Low charge.	Recharge system.
	Evaporator blower malfunction.	Repair or replace blower.
	Defective expansion valve (closed).	Replace expansion valve.
	Restricted liquid line.	Replace line.
	Restricted suction line.	Replace line.
	Thermostatic switch inoperative.	Replace switch.
	Compressor clutch will not release.	Repair or replace compressor clutch.
Insufficient Cooling of Air Flow	Defective thermostatic switch.	Replace switch.
	Slipping compressor belt.	Tighten belt.
	Compressor defective.	Repair or replace compressor.
	Compressor clutch malfunction.	Repair or replace clutch.
	Expansion valve malfunction.	Replace expansion valve.
	Low charge.	Recharge system.
	Oil overcharge.	Evacuate and recharge system.
	Plugged condenser.	Clean condenser.
	Fan belt and/or fan inoperative.	Replace belt - repair fan.
	Overcharge or R12.	Evacuate and recharge system.
	Moisture in system.	Evacuate and recharge system.
	Air in system.	Evacuate and recharge system.
	Clogged evaporator.	Clean or replace evaporator.
	Restricted lines.	Replace lines.
	Engine overheating.	See engine section.
	Plugged evaporator drain.	Clean evaporator drain tray.
	Evaporator icing.	Check expansion bulb.



R134A Recovery, Recycling/Charging Station **Figure 11D-58**

If you want to remove, clean, and reuse R134A refrigerant at your shop, you must use a machine that both extracts and recycles refrigerant from mobile air-conditioning systems and dedicate that machine to be used only with R134A.

New Holland, through it's tool distributor (OTC Tools), makes available to it's dealers an R134A Recovery/Recycling and Recharging Station. Tool #OEM1418, Figure 11D-58 will recover, recycle, and recharge the R134A refrigerant from the tractor being serviced. Contact OTC Tools for more information on tool #OEM1418.

USING RECYCLING EQUIPMENT

Recycling equipment is defined as equipment that both extracts and removes common contaminants from refrigerants. Recycling equipment designed and certified to meet SAE standards can make refrigerant recovery from mobile air-conditioning systems suitable for reuse in automotive A/C systems. Like recovery equipment, SAE standards require that each piece of recycling equipment be dedicated to a single refrigerant.

Note that only equipment capable of recovering and cleaning R134A to meet SAE J2099 purity levels can be certified as meeting SAE standards. Recycling equipment capable of purifying R134A to SAE J2099 purity levels will carry a label which contains the phrase "Design certified by Underwriters Laboratories, Inc. for compliance with SAE J2099." Note that the Underwriters Laboratories label which certifies that the machine is free of reasonable shock or other safety hazards to the user is NOT an indication of compliance with SAE standards. The UL label must specifically state that the machine is "designed certified" to the applicable SAE standard.

USING RECOVERY EQUIPMENT

Recovery equipment is relatively small and easily portable. It is best used in situations where a shop must service vehicles such as agricultural or off-highway equipment that cannot easily be brought into a shop. It is also convenient for shops that must deal with a variety of different refrigerant types and exchange recovered refrigerant for reclaimed refrigerant at some central location.

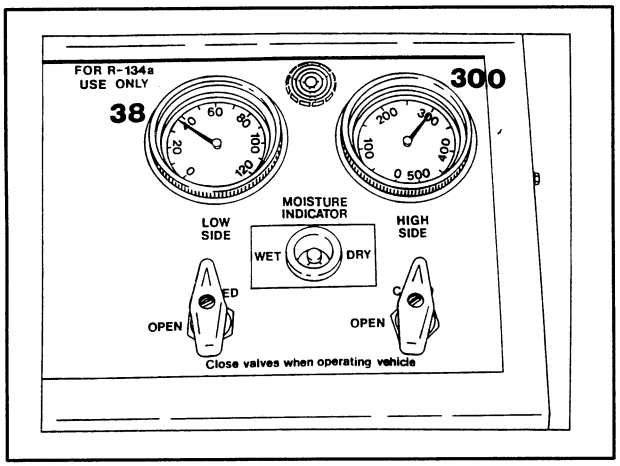
New Holland, through it's tool distributor (OTC Tools), makes available to it's dealers an R134A Portable Recovery Station. Tool #OEM1533 will recover R134A refrigerant from the tractor being serviced. Contact OTC Tools for more information on tool #OEM1533. This tool is most useful when working on a unit at a remote location.

NOTE: Recovered refrigerant from the OEM 1533 Recovery Station should not be re-introduced into the air conditioning system without first being recycled or reclaimed. The recovery station is only intended to remove the refrigerant from the tractor's air conditioning system.

Recovery equipment must be used for those refrigerants for which it was designed. The lubricants, hoses and seals in this equipment have been designed to work with only one refrigerant.

PREVENT MIXING OF SERVICE EQUIPMENT

Refrigerants must not be mixed. For this reason, service fittings are different for refrigerants R12 and R134A. Systems using R134A have quick couple service connections while R12 systems use screw threads. The intent of this is to prevent the use of the same tools for different refrigerants, thereby avoiding mixing of refrigerants in the service equipment.



R134A Manifold Gauge Readings Figure 11D-66

GAUGE READINGS AND INTERPRETATIONS - R134A SYSTEMS

EXAMPLE 5 - FIGURE 11D-66

PROBLEM:

Insufficient or no cooling. Engine overheats in some cases.

CAUSE:

Condenser not functioning properly.

CONDITIONS*

1. Low side pressure too high. Gauge should read 7 PSI-30 PSI.
2. High side pressure too high.
3. Liquid line hot.
4. Evaporator air warm.

CORRECTIVE PROCEDURES

1. Check belt tension. Loose or worn drive belts could cause excessive pressures in the compressor head.
2. Look for clogged passages between the condenser fins and coil, or other obstructions that could reduce condenser air flow.
3. If engine overheating is a symptom, check radiator fan and pressure cap for proper operation.

Operate the system and check its performance. If still unsatisfactory, proceed as follows.

4. Check for overcharge of refrigerant, and correct as follows:
   a. Discharge and recover the refrigerant.
   b. Add new refrigerant.

Operate the system and recheck the performance. If the gauge readings are still too high, proceed as follows.

5. Recover the refrigerant from the system.
6. Remove the condenser; if it appears dirty or plugged, replace it.
7. Replace the receiver/dryer.
8. Evacuate the system, and recharge it.
9. Performance test the system.

DIAGNOSIS: Lack of cooling caused by pressure that is too high on the high side, resulting from improper operation of condenser. (Refrigerant charge may be normal or excessive.)

***NOTE: Test procedure based upon ambient temperature of 95°F. For proper high side gauge reading for other ambient temperatures, refer to the Pressure/Temperature Relationships chart, Figure 11D-61.**

FLUSHING THE A/C CIRCUIT

Some service or repair operations have been flushing A/C systems to remove dirt or other debris. It has been common practice to use another CFC, usually R11, for this purpose. The Clean Air Act prohibits the use of any CFC for such a purpose where the CFC may be released into the atmosphere. Methylchloroform, a popular flushing agent, is also prohibited.

CAUTION: FLUSHING SHOULD NEVER BE DONE WITH COMPRESSED AIR. CERTAIN MIXTURES OF AIR AND R134A ARE COMBUSTIBLE. THE USE OF AIR TO FLUSH R134A SYSTEMS COULD RESULT IN COMBUSTION. COMPRESSED AIR ALSO CONTAINS MOISTURE WHICH WOULD CONTAMINATE THE SYSTEM.

IMPORTANT: Never use CFC-11, R11, CFC-12, R12, CFC-113, R13 or any substance to flush an R134A system. To do so would result in breakdown of the lubricant and system corrosion.

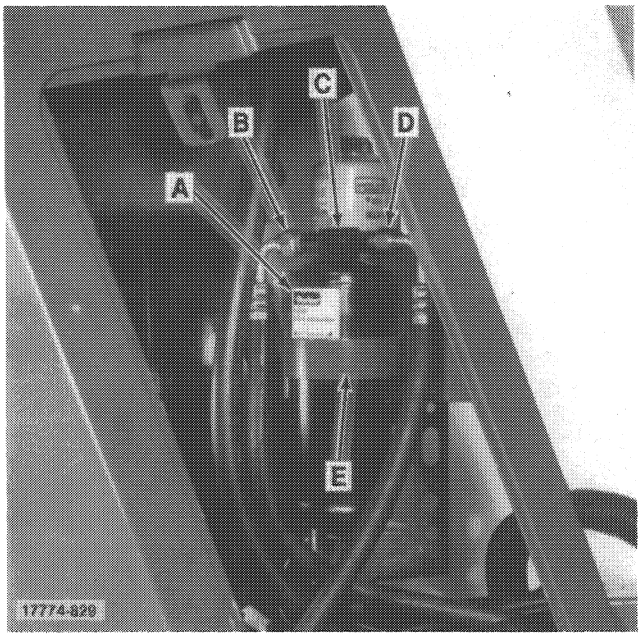
Use of other flushing solvents may cause other problems. If a vacuum pump does not remove the solvent, it could affect the chemical stability of the refrigerant and lubricant.

At the time of this publication, a satisfactory flushing agent for R134A air conditioning systems had not been developed. If a contaminant is present in the system, use R134A as a flushing agent to remove the contaminant. If the contaminant can not be satisfactorily removed, replace the system components.

In the event of a major compressor failure replacing the compressor output pressure line and receiver/dryer should collect most of the debris.

REFILLING

Refilling the air conditioning system must be done by the weight method. The lubricants used in R134A tend to layer onto the walls of the refrigeration system. This layering obscures the view through the sight glass. Visual methods of refilling R134A systems will result in improper system charging. For this reason, the old practice of "topping off" a partially discharged air conditioning system using the sight glass is no longer recommended. The 9030 tractor air conditioning system has a capacity of 4.5 lbs (2.04 kg) of R134A refrigerant.



Receiver/Dryer **Figure 11D-96**

A Receiver/dryer
B Outlet line
C Sight glass
D Inlet
E Clamp

RECEIVER/DRYER - REMOVAL

1. Discharge the air conditioning system. See "Discharging the System" in this section.
2. Remove the inlet line, D, Figure 11D-96, from the receiver/dryer.
3. Remove the outlet line, B, from the receiver/dryer.
4. Remove the clamp, E, and the receiver/dryer.

   NOTE: The receiver/dryer is not repairable, replace if required.

RECEIVER/DRYER - INSTALLATION

1. Set the new receiver/dryer in place and secure with the clamp, E, Figure 11D-96.
2. Secure the outlet line to the receiver/dryer by tightening fitting, B. See "Torque Values" in "Specifications" in this section.
3. Secure the inlet hose to the receiver/dryer by tightening fitting, D. See "Torque Values" in "Specifications" in this section.
4. Charge the air conditioning system. See "Charging the System" in this section.
5. Check for leaks at the fittings on the receiver/dryer. See "Leak Testing the System" in this section.

AIR CONDITIONING HOSES AND LINES

Air conditioning hoses must be free of cracks or breaks and should be firm. The connections should be rust free, uncracked, and without leaks. The air conditioning lines must be free of kinks, twists, rust, cracks, and leaks.

AIR CONDITIONING HOSE AND LINE REPLACEMENT

1. Discharge the air conditioning system. See "Discharging the System" in this section.
2. Remove the fittings securing the defective hose or line and remove the hose or line.
3. Remove the protective caps from the new hose or line and coat the fitting O-rings with clean refrigerant oil.
4. Install the hose or line. Torque the fittings. See "Torque Values" in "Specifications" in this section.
5. Charge the air conditioning system. See "Charging the System" in this section.